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Econometric Estimates of Scale Economies in Canadian Manufacturing

by

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ABSTRACT

This study is one of a series of technical papers that provide details of the Department of Finance's analysis of the impact of Canada-U.S. free trade. Results of the Department of Finance analysis were summarized in the document The Canada-U.S. Free Trade Agreement: An Economic Assessment. This paper reports on an econometric analysis of cost-scale relationships in 147 Canadian manufacturing industries using plant-level data for 1979. Following Fuss and Gupta (1981), the econometric work is based on the assumption that the production process is homothetic. In addition to providing more up-to-date estimates, this study, in contrast to the Fuss and Gupta analysis, makes use of true plant data rather than data arranged in size groups. Moreover, it relaxes the assumption that wage rates and product diversity are constant for all plants.

The results obtained suggest that there are increasing returns to scale in a majority of Canadian manufacturing industries. At the same time, this research indicates that a significant fraction of industries are characterized by constant returns. The results also suggest that the cost penalty associated with sub-optimal production scale corresponds to roughly 4 per cent of total manufacturing costs in 1979. Finally, although wage rates and product diversity have no significant impact on unit cost in most industries, some specific industries and, consequently, the aggregate results are affected by the inclusion of these variables in the cost function.

RÉSUMÉ

Cette étude fait partie d'une série de rapports techniques qui documente l'analyse de l'impact du libre-échange canado-américain effectuée par le ministère des Finances. Les résultats de cette analyse sont résumés dans le document, Accord de libre-échange entre le Canada et les États-Unis: Une évaluation économique. En utilisant des données spécifiques aux établissements, ce document présente une analyse économétrique de la relation existant entre les coûts et l'échelle de production pour 147 industries manufacturières canadiennes en 1979. S'inspirant de Fuss et Gupta (1981), l'analyse économétrique est basée sur l'hypothèse d'homothéticité du processus de production. En plus d'offrir des estimations plus récentes, cette étude, à l'inverse des travaux de Fuss et Gupta, utilise des données internes aux établissements plutôt que des données regroupées selon la taille des établissements. De plus, on ne fait pas l'hypothèse que les taux de salaire et la diversité de la production sont constants pour tous les établissements.

Les résultats obtenus suggèrent qu'il y a des rendements à l'échelle croissants dans la majorité des industries manufacturières canadiennes, mais que des rendements constants caractérisent un nombre significatif d'industries. Les résultats suggèrent également que la pénalité de coût résultant d'échelle de production sous-optimale correspond à environ 4 pour cent des coûts manufacturiers totaux en 1979. Finalement, même si les taux de salaire et l'indice de diversité de la production n'ont pas d'impact significatif sur les coûts moyens dans la plupart des industries, quelques industries et, par conséquent, les résultats agrégés sont affectés par l'inclusion de ces variables dans la fonction de coût.

1. Introduction

The Department of Finance has recently completed a major research project evaluating the overall impact of the Canada-U.S. Free Trade Agreement on the Canadian economy. The conclusions of this research were summarized in the document The Canada-U.S. Free Trade Agreement: An Economic Assessment. This study is one of a series of papers dealing with technical aspects of this research on the economic impact of the Free Trade Agreement on the Canadian economy. This paper deals with the scale economy estimates used in the Department's quantitative assessment of the longer-term impacts of the Free Trade Agreement using a general equilibrium model.

The possible existence of unexploited economies of scale in Canadian manufacturing industries has important implications for competition policy, Canada-U.S. productivity comparisons and the impact of freer trade. For example, it is often argued that, by reducing the size of the market, trade barriers limit the scope for realizing economies of scale (Eastman-Stykolt (1967)). Plants serving the domestic market are thought to be too small or to be insufficiently specialized to reach the minimum efficient scale of production (MES). If this is the case, the removal of trade barriers would raise industry-specific efficiency as well as shift resources from low- to high-productivity industries.

This paper reports on an econometric analysis of cost-scale relationships in 147 Canadian manufacturing industries using plant-level data for 1979. The use of plant-level data permits estimation of the micro long-run average cost curve for a given technology and size distribution of plants. As shown by Sato (1975), the use of industry-level time-series data would not in general provide information on the shape of the micro long-run average cost curve for three reasons. First, it is generally not possible to fully control for changes in technology. Second, the micro cost curve can only be identified from time-series data if there is a large change in the size distribution of plants over time. Third, industry-level estimates derived from

time-series data may also reflect scale economies internal to the industry but external to the plant. Thus, in general, the estimates derived from time-series data cannot be used to identify the micro long-run average cost curve.

Econometric estimates of scale economies using plant level data are quite rare: there appear to be only two studies relating to Canadian manufacturing, those of Fuss and Gupta (1981) and Baldwin and Gorecki (1986).[1] The study by Fuss and Gupta is based on data of the late 1960s. In addition to providing more up-to-date estimates, our study makes use of true establishment data rather than data arranged in size groups as in Fuss and Gupta. Furthermore, our study relaxes the potentially important assumption made by Fuss and Gupta that wage rates and product diversity are constant for all establishments.

The study by Baldwin and Gorecki also makes use of establishment data. Unfortunately, the methodology adopted by Baldwin and Gorecki constrains the estimated production function, and consequently the cost curve, to be homogeneous, which means that returns to scale must be increasing, decreasing or constant, but not some combination of the three possibilities. In other words, they constrain the scale elasticity to be the same at all output levels. Given this methodology it would not be possible to estimate, for example, a U-shaped or an hyperbolic unit cost curve. While this assumption may or may not bias the results, it makes it difficult to establish important parameters such as the MES and the cost penalty of sub-optimal scale. The functional form used in this study does not impose homogeneity.

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1. Cross-section studies are usually done for specific sectors such as electric power, railroads, trucking, transportation and communications industries (see Jorgenson (1984) for a survey). In other countries, there are also the studies by De Brabander and Vanlommel (1978) - Belgium -, Corbo and Meller (1979) - Chile -, Griliches and Ringstad (1971) - Norway - and Gupta (1968) - India - for manufacturing industries. Finally, Daly and Rao (1986), Rao and Preston (1983) and Zohar (1982) are time-series studies of Canadian manufacturing.

The results obtained in this study suggest that there are increasing returns to scale in a majority of manufacturing industries, but also that a significant fraction of industries are characterized by constant returns. Only a small portion of industries exhibits decreasing returns to scale, and these results are not generally statistically significant. The results also suggest that the cost penalty associated with sub-optimal scale corresponds to roughly 4 per cent of total manufacturing costs.

This paper is organized as follows. The estimated models are presented in section 2. The micro data set used and the exclusion criteria applied to these data are described in section 3. Section 4 provides a detailed discussion of the empirical results. Section 5 presents an assessment of the results based on the methodological problems usually associated with econometric approach. The final section summarizes the main conclusions of the paper. An annex provides the detailed results for the two- and four-digit (estimation level) industrial classifications.

2. The Model

Following Fuss and Gupta (1981), the econometric work in this paper is based on the assumption that the production process is homothetic. This approach is more or less imposed by the lack of establishment-specific data for capital. Even though there is little likelihood that this hypothesis is strictly correct, the empirical evidence noted in Robidoux (1987) suggests it is a tolerable approximation. The homotheticity hypothesis means that factor proportions depend only on relative prices; the level of output does not have an independent effect on factor proportions. This property of homothetic functions permits exclusion of capital costs from the left-hand side of the unit cost equations without affecting scale

economy estimates.[2] In other words, this assumption enables us to infer the scale characteristics of the average total cost function from the unit non-capital cost function. Formally, the basic total non-capital cost function is:[3]

$$(1) \qquad C(p_i,d,Q) = H(Q).h(p_i,d)$$

where,

$$(2) \qquad H(Q) = Qe^{(\alpha_1 + \alpha_2 Q + \alpha_3 Q^{-1})}$$

$$(3) \qquad h(p_i,d) = p_{w1}^{\alpha_4} \cdot p_{w2}^{\alpha_5} \cdot p_k^{\alpha_6} \cdot p_m^{\alpha_7} \cdot p_e^{\alpha_8} \cdot d^{\alpha_9}$$

Substituting equations (2) and (3) in equation (1), dividing by Q and taking the logarithm on each side, we obtain the unit non-capital cost function:

$$(4) \qquad \ln(C/Q) = \alpha_1 + \alpha_2 Q + \alpha_3 Q^{-1} + \alpha_4 \ln p_{w1} + \alpha_5 \ln p_{w2} + \alpha_6 \ln p_k + \alpha_7 \ln p_m + \alpha_8 \ln p_e + \alpha_9 \ln d$$

Where Q is gross output; C is the sum of labour, materials and energy costs; p_{w1} and p_{w2} are the wage rates for production and administrative workers, respectively; p_m is the price of materials; p_e is the price of energy; p_k is the price of capital; d is a product diversity index; and α_i are unknown parameters. Given the statistics available, p_m, p_e and p_k are assumed to be identical for all establishments in a given industry. Therefore, adding a random error term, the estimating equation is:

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2. See Fuss and Gupta (1981).

3. For more details on the underlying general cost function and the derivation of this specific homothetic non-capital cost function, see Fuss and Gupta (1981) or Robidoux (1987).

Model A

$$(5)\quad \ln(C/Q) = \alpha_1 + \alpha_2 Q + \alpha_3 Q^{-1} + \alpha_4 \ln p_{w1} + \alpha_5 \ln p_{w2} + \alpha_9 \ln d + u_a$$

and the scale elasticity is equal to:

$$(6)\quad \varepsilon_{CQ}^{-1} = \left(\frac{\partial \ln C}{\partial \ln Q}\right)^{-1} = (\alpha_2 Q - \alpha_3 Q^{-1} + 1)^{-1}$$

We have increasing returns to scale when $\varepsilon_{CQ}^{-1} > 1$; decreasing returns to scale when $\varepsilon_{CQ}^{-1} < 1$ and constant returns to scale when $\varepsilon_{CQ}^{-1} = 1$.

This non-capital cost function represents exactly a total cost function in the specific sense that the ratio of non-capital costs to total costs remains constant when Q varies if prices and other industry characteristics, such as product diversity, are also constant. This property follows directly from the homotheticity assumption, which means that input proportions are independent of the level of production.[4] In contrast to the approach used by Baldwin and Gorecki (1986), this specification of the cost function does not impose homogeneity.

We have also estimated the model used by Fuss and Gupta (1981). It corresponds to equation (5) where the parameters α_4, α_5 and α_9 are constrained to zero, i.e.:

Model B

$$(7)\quad \ln(C/Q) = \beta_1 + \beta_2 + \beta_3 Q^{-1} + u_b$$

and the scale elasticity is given by:

$$(8)\quad \varepsilon_{CQ}^{-1} = \left(\frac{\partial \ln C}{\partial \ln Q}\right)^{-1} = (\beta_2 Q - \beta_3 Q^{-1} + 1)^{-1}$$

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4. For more details on homothetic function proprieties, see Førsund (1975), Fuss and Gupta (1981) and Robidoux (1987).

The comparison of the two models will permit to evaluate the impact on cost function estimates of leaving wage and diversity out of the equation.

Leaving wage rates out of the estimating equation would not, in principle, cause problems if differences in labour efficiency were exactly reflected in wage rates: the estimated coefficients would be zero in this case and the average efficiency-adjusted wage rate would be absorbed in the constant term of the equation. Consequently the estimated coefficients will indicate the extent that efficiency differentials are not exactly reflected in wage rates, and may be negative, positive or zero.

The results obtained by Miller (1981) indicate that wage rates are not constant across plant sizes as larger plants tend to pay higher wages. Therefore, if higher labour productivity does not totally compensate for higher wages, we will expect that leaving wage rates out of the model will cause a downward bias on scale elasticity and cost penalty estimates. This potential specification error problem is noted, inter alia, by Baldwin and Gorecki (1986) and Ware (1986).

The coefficient on product diversity reflects the combined effects of economies or diseconomies of scope (Panzar and Willig (1981)) and diseconomies caused by reductions in production run length, since output is held constant. Hence, as for wage rates, the independent effect of product diversity on average cost is theoretically undetermined. In addition, the scale economy parameters derived from model A capture the combined effects of changes in output and production run length, holding product diversity constant.

Four regressions of equations (5) and (7) are performed for each industry using ordinary least squares[5]: the first includes both Q and Q^{-1}; the second includes only Q; the third includes only Q^{-1}; and

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5. It was assumed that disturbances are homoscedastic. No test for heteroscedasticity was performed. Note however that even if disturbances are heteroscedastic, the OLS coefficient estimates are still unbiased.

the final one includes neither Q nor Q^{-1}. One of these regressions is considered to represent the true average cost curve of an industry on the basis of maximization of the adjusted R-squared as suggested by Theil (1971; p. 543).

The shape of the average cost curve varies depending on which of the four possible regression specifications is chosen and depending on the signs of coefficients. The possible shapes of the unit cost curve are presented in Table 1.

Table 1: Shapes of the average cost curve: Model A[1]

#	Coefficient Signs	Shape
1.	$\alpha_2, \alpha_3 > 0$	U: U-shaped cost curve
2.	$\alpha_2, \alpha_3 < 0$	IU: inverted U-shaped cost curve
3.	$\alpha_2 < 0, \alpha_3 > 0$	L: non-asymptotic negative-sloped curve
4.	$\alpha_2 > 0, \alpha_3 < 0$	IL: non-asymptotic positive-sloped curve
5.	$\alpha_2 = 0, \alpha_3 > 0$	H: asymptotic negative-sloped curve
6.	$\alpha_2 = 0, \alpha_3 < 0$	IH: asymptotic positive-sloped curve
7.	$\alpha_2 < 0, \alpha_3 = 0$	S-: negative-sloped straight line
8.	$\alpha_2 > 0, \alpha_3 = 0$	S+: positive-sloped straight line
9.	$\alpha_2 = \alpha_3 = 0$	S: constant returns to scale

1. The same shapes for Model B are obtained by replacing α_i by β_i.

There are three methods of calculating the minimum efficient scale (MES) depending on the final specification chosen. First, if the final regression corresponds to specification 1 of Table 1, the MES is equal to $\sqrt{\alpha_3/\alpha_2}$ for model A and $\sqrt{\beta_3/\beta_2}$ for model B. Second, if the final regression corresponds to specification 5 of Table 1, the MES is equal to the average size of the largest plants accounting for 50 per cent of industry output (Top-50 measure). Third, if the final regression corresponds to specification 3 or 7, the MES is equal to Top-40 measure. In all other cases the MES is undefined.

Standard industrial organization summary statistics for scale economies include the cost disadvantage ratio (CDR). This ratio measures the proportionate rise in unit cost when plant size decreases from MES to one-half MES. Formally we have:

$$(9) \qquad CDR = (AC_{\frac{1}{2}mes} - AC_{mes})/AC_{mes}$$

and,

$$(10) \qquad AC_{\frac{1}{2}mes} = \exp(\hat{\alpha}_1 + \hat{\alpha}_2 Q_{\frac{1}{2}mes} + \hat{\alpha}_3 Q_{\frac{1}{2}mes}^{-1} + \hat{\alpha}_4 \ln\overline{p_{w1}} + \hat{\alpha}_5 \ln\overline{p_{w2}} + \hat{\alpha}_9 \ln\bar{d})$$

$$(11) \qquad AC_{mes} = \exp(\hat{\alpha}_1 + \hat{\alpha}_2 Q_{mes} + \hat{\alpha}_3 Q_{mes}^{-1} + \hat{\alpha}_4 \ln\overline{p_{w1}} + \hat{\alpha}_5 \ln\overline{p_{w2}} + \hat{\alpha}_9 \ln\bar{d})$$

where $\hat{\alpha}_i$ is an estimated coefficient and a bar over a variable indicates that the regression sample mean value is used.

In addition to the CDR, this study provides a new measure of the cost penalty associated with sub-optimal capacity; the cost saving achievable (CSA) if all plants were the minimum efficient size. This statistic is defined as:

$$(12) \qquad CSA = (\overline{AC} - AC_{mes})/\overline{AC}$$

where $\overline{AC}$ is the average cost observed in the regression sample and AC_{mes} is defined by equation (11).

This new measure of cost penalty can be seen as a complement to or a substitute for the standard CDR measure.[6] The CDR is a point approximation of the shape of the unit cost curve at one-half MES. It gives an indication of the cost penalty implied by the shape of the unit cost curve without taking into account the size distribution of plants around this curve. In contrast, CSA has the advantage of taking into account both the shape of the unit cost curve and the size distribution of plants.

3. Data

The data used to estimate the unit cost function are from the Census of Manufactures. Census statistics by individual establishments may be accessed through Statistics Canada's Business Microdata Integration and Analysis Division. In terms of the Census definitions the variables are as follows:

- Gross production, Q, is calculated as the sum of sales and the change in inventories or, equivalently, as the sum of value added and intermediate input costs.

- The wage rate of production workers, p_{w1}, is equal to the wage bill of production and related workers divided by hours worked.

- The wage rate of non-production workers, p_{w2}, is calculated as the wage bill of administrative, office and other non-manufacturing employees divided by usual hours worked. Usual hours worked correspond to standard weekly hours times the number of weeks effectively worked (i.e., 52 less paid vacation time and statutory holidays, both expressed in weeks).

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6. For example, it is more appropriate to use the CSA parameter to calibrate a cost function in a general equilibrium model, such as the GET model developed by Harris (1984), rather than the usual CDR. As noted by Hazledine (1984), using the CDR measure to calibrate the cost function implied an over-estimation of the cost reduction possible by exploiting economies of scale. In contrast, the CSA parameter eliminates this calibration problem.

- The non-capital cost of production, C, is equal to the sum of wage payments to production and non-production workers; cost of materials, supplies, fuel and electricity used during the production process; and goods purchased for resale.

- The product diversity index, d, is defined as $(\Sigma_{i=1}^{n} S_i^2)^{-1}$ where S_i is the proportion of the plant's sales associated with the i th product of the 4-digit industrial commodity classification. The product diversify index is, in other words, the reciprocal of the Herfindahl index and varies between 1 and infinity, a higher value indicating a higher level of diversity.

The Census collects data on manufacturing and other activities (e.g. wholesaling and own-account construction) of manufacturers. However, a consistent set of data on costs, output and prices can only be created on a total activity basis. Consequently the variables used in this analysis are measured on a total activity basis. In addition, as explained in section 5, 1979 was selected as the year for our analysis on the basis that, compared with more recent years, fewer problems with variations in utilization rates and the relative price of energy were expected.

We applied a number of exclusion criteria to the data. The criteria and their impact are summarized in Table 2.

- First, census small, or "short-form", establishments were excluded. The reason for this exclusion is the inconsistent definition of variables between small and large establishments and the nonexistence of many variables for small establishments. Unincorporated establishments were also excluded.

- Second, we excluded establishments for which one or more of the basic variables used in equation (5) was missing.

- Third, plants ceasing operations in 1979 were excluded on the grounds that they were inefficient.

- Fourth, we excluded establishments for which the ratio of manufacturing gross output to total gross output was less than 0.9. The purpose of this criterion is to ensure that plants included in the analysis undertake primarily manufacturing activity.

- Fifth, plants with average wage rates (p_{wi}) below \$2.00 and above four times the average wage rate of the industry were excluded.[7] Similarly, we excluded plants for which the differential in absolute value between its materials cost share and the mean value of the industry share is superior to two times the standard deviation of the industry share. The extreme values of the wage and materials cost share distributions were excluded to minimize the effects of measurement error. In addition, extreme values for the materials cost share could also reflect the use of a different technology than most commonly used by other plants in the industry.

- Finally, we excluded plants having less than 20 production workers. Data for small plants is likely to be much less accurate than that for larger plants, for at least three reasons: (i) less care is likely taken to ensure accuracy by both respondents and by Statistics Canada in their verification process; (ii) as first noted by Stigler (1963), it is difficult to distinguish between labour income and profits in smaller firms; and, (iii) the classification of small plants by industry is often arbitrary due to a large variance in the composition of output. The definition of small plants is obviously arbitrary; the choice of 20 production workers was based partly on the reduction in the variance of average costs at the low end of the size distribution as more plants were excluded.

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7. Extreme bounds used to exclude outliers are always arbitrary. In this case, we know from Létourneau (1984) that in 1979 Canadian minimum wages ranged from \$2.75 (in Nova Scotia and Prince Edward Island), and \$3.50 (in Saskatchewan). Taking this information into account, we set the average wage lower bound at \$2.00 in order to be certain that only plants for which wages were incorrectly measured were excluded.

Table 2: Impact of the Exclusion Criteria Applied

	Value of Production ($ billions)	Number of Plants
Census of Manufactures	179.1	34,578
Exclusions:		
"Short-Form" Plants	-	17,637
Unincorporated Plants	-	75
Missing Data Points	-	3,557
Plants Ceasing Operations	-	336
Share of Non-Manufacturing Activity in Total Exceeds 10%	-	2,895
Extreme Values of Wage Rates	-	50
Extreme Values of Materials Share in Total Costs	-	536
Establishments Having Less Than 20 Production Workers	-	1,882
After all Exclusions	113.0	7,610

Before exclusions, the Census of Manufactures indicates a manufacturing gross output of $179.1 billion produced by 34,578 plants in 1979. In the regression sample gross output of $113.0 billion is produced by 7,610 plants. Thus, the application of all exclusion criteria results in 37 and 78 per cent of gross output and plants respectively being excluded from the analysis. Based on this sample, it was possible to estimate a cost function for 147 of the 173 four-digit manufacturing industries; these 147 industries account for 97 per cent of manufacturing gross output in 1979.

4. Empirical Results

This section is divided in four parts. First, the results obtained with our preferred specification, Model A, are presented. Second, an analysis of the impact of wage rates and product diversity on scale economy estimates is undertaken by comparing results obtained with models A and B. Third, our results are compared with the results obtained in other Canadian studies using plant data. Finally, the statistical significance of the results is analyzed.

4.1 Preferred Model

The distribution of industries according to the shape of the long-run unit cost curve and the nature of returns to scale are presented in Tables A1 to A3 of the annex. The results from Model A suggest there are increasing, constant, and decreasing returns, respectively, in 57 per cent, 30 per cent and 14 per cent of the industries analysed. This figure corresponds to, respectively, 68 per cent, 25 per cent and 7 per cent of total manufacturing production.[8] The traditional U-shaped average cost curve applies in only 7.5 per cent of the industries. The hyperbolic curve is the most common (31 per cent) in manufacturing industry, according to our results.

The finding that some industries exhibit decreasing returns to scale should be interpreted cautiously, for two reasons. First, even if the theoretical unit cost curve exhibits decreasing returns to scale for some output levels, in practice plants should not be observed in this portion of the curve because the higher costs are avoidable. However, it is possible that industries exhibit decreasing returns because bigger and older plants do not integrate technical changes and are,

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8. Here, total manufacturing production corresponds to manufacturing gross output where exclusion criteria 1 to 3 of Table 2 are applied.

consequently, inefficient. In other words, the decreasing returns could reflect the fact that smaller and bigger plants are not on the same cost curve. Second, as indicated below, these results are partly spurious since virtually none of these industries have statistically significant decreasing returns to scale.

Summary statistics relating to the MES and cost implied by sub-optimal capacity are presented in Tables 3 and 4. Details on these and other characteristics of the estimated unit cost curve for four- and two-digit industries are presented in annex tables. As shown in the upper panel of Table 3, the estimated cost functions indicate that the MES is generally small relative to industry output. In 51 per cent of the industries exhibiting increasing returns to scale the MES is no more than 5 per cent of industry output. However, in some industries the MES implies a relatively small number of plants in order to fully exploit economies of scale: in 28 per cent of the industries with increasing returns, the MES exceeds 10 per cent of industry output.

The estimated cost functions also indicate that the cost curve is not very steep in most industries. As can be seen from the middle panel of Table 3, in just over half of the industries exhibiting increasing returns, the penalty for operating at one-half of the MES does not exceed 2 per cent of average costs. In contrast, the cost disadvantage ratio exceeds 5 per cent in approximately one-third of industries exhibiting increasing returns to scale.

However, a better measure of the importance of unexploited scale economies is probably the cost saving achievable by eliminating sub-optimal production. The results suggest that the cost saving associated with the elimination of sub-optimal production is smaller than often supposed, but still substantial. As indicated in Table 4 if all manufacturing output were produced at the MES, the total cost of production would fall by 5.4 per cent in industries exhibiting increasing returns to scale, or by 3.7 per cent for all industries

Table 3: Summary Characteristics of the Long-Run Average Cost Curve of Industries Exhibiting Increasing Returns to Scale(1)

MES as a Percentage of Industry Production

	0 - 1%	1 - 2%	2 - 5%	5 - 10%	10 - 50%
Model A	8 (9.6)	12 (14.5)	22 (26.5)	18 (21.7)	23 (27.7)
Model B	12 (14.3)	12 (14.3)	24 (28.6)	16 (19.0)	20 (23.9)

Cost Disadvantage Ratio at One-Half MES

	0 - 2%	2 - 5%	5 - 25%	25 - 50%
Model A	44 (53.0)	8 (9.6)	29 (34.9)	2 (2.4)
Model B	48 (57.1)	10 (11.9)	24 (28.6)	2 (2.4)

Cost Saving Achievable

	0 - 5%	5 - 10%	10 - 15%	15 - 50%
Model A	44 (53.0)	26 (31.3)	6 (7.3)	7 (8.4)
Model B	43 (51.2)	27 (32.1)	10 (11.9)	4 (4.8)

(1) The first number indicates the number of industries and the percentage of total is in brackets.

examined.[9] The cost saving achievable can be put in perspective by noting that in 1979, manufacturing gross output was approximately $180 billion. A 3.7 per cent reduction in manufacturing costs would therefore represent a resource saving of $6.7 billion, or 2.7 per cent of GDP (at factor cost) in 1979.

9. The CSA is a measure of the cost penalty associated with non-optimal rather than sub-optimal plants, since plants larger than the MES have not been excluded. However, treating industries with U-shaped curves as having constant returns to scale leaves the results virtually unchanged, reducing the CSA from 3.7 to 3.5 per cent.

Finally, we note that the shape of the average cost curve is highly variable within major industry groupings. Most two-digit groupings encompass industries exhibiting increasing as well as constant returns to scale.

Table 4: Summary of Aggregate Results

	Model A	Model B
Scale elasticity at ½ mes		
All industries	1.06	1.03
Increasing returns only	1.08	1.05
Cost Disadvantage at ½ mes (%)		
All industries	2.3	1.9
Increasing returns only	3.4	3.2
	Percentage of Manufacturing Costs	
Cost Saving Achievable		
All industries	3.7	2.8
Increasing returns only	5.4	4.7
	Percentage of Manufacturing Output	
Returns to Scale		
Increasing	68.2	59.0
Constant	24.8	20.9
Decreasing	6.9	20.1
Minimum efficient scale	4.7	4.8

4.2 Impact of Wage Rates and Product Diversity

As noted above, the anticipated impact of wage rates on average cost is ambiguous because it is not possible to control for differences in labour efficiency. If wage differentials across plants exactly reflect differences in productivity, as human capital or efficiency wage theories predict, the estimated coefficients on wage rates would be zero. If wage differentials are insufficient to compensate for higher productivity, the estimated coefficients on wages will be negative or vice versa. The results suggest that the first condition is realized in

most industries since, in general, wage rate differentials have no impact on unit cost. As an illustration, neither of the two wage coefficients are statistically different from zero at a 10 per cent confidence level (one-tail t-test) in roughly 55 per cent of industries.[10]

The net impact of product diversity reflects the combined effects of economies of scope and diseconomies caused by reductions in production run length. In the majority of industries examined, economies of scope are generally just large enough to compensate for the higher costs caused by reducing production run length, so that diversity has no net impact on unit cost. However, in other industries the net effect of increasing diversity and reducing production run length is more often to raise than lower costs. For 21 per cent of industries the coefficients of product diversity are positive and significant while only 8 per cent of industries have a negative and significant coefficient at the 10 per cent level (one-tail t-test).

A comparison of results obtained with models A and B is presented in Table 4. The results suggest that including wage rates and an index of product diversity in the regression increases the importance of scale economies, but not dramatically. The most significant change is the reduction in the percentage of production originating in industries with decreasing returns to scale. The model excluding wages and diversity underestimates by almost 10 percentage points manufacturing production originating in industries with increasing returns to scale and overestimates by 13 percentage points production originating in industries with decreasing returns to scale.

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10. The coefficients associated with wage rates are split almost evenly between positive (58%) and negative (42%) values. On the basis of a one-tail t-test the positive and negative coefficients are significantly different from zero in only 29 per cent and 27 per cent of cases respectively at 10 per cent confidence level. The negative coefficients violate the convavity property of the cost function only if labour is homogenous (or, less strictly if wage differentials are superior to differences in efficiency) as is assumed in theoretical analysis.

In addition, the impact on individual industries is more substantial. In 28 industries the cost saving achievable varies by more than 5 percentage points in the two models. Similarly, in 22 industries the CDR varies by more than 5 percentage points when the two models are compared.

In sum, even if wage rates and diversity generally have no impact on unit cost in most industries, some specific industries and, by inference, the aggregate results are significantly affected by the exclusion of these variables. It seems that the wage specification error noted by Baldwin and Gorecki (1986) and Ware (1986) is present in some industries and has a significant impact on the aggregate results. However, we should emphasize that, according to our results, it is incorrect to present this wage specification error as a general problem.

4.3 Comparison with other Canadian Studies

How do these estimates compare with the results obtained in other studies using establishment data? As noted above, for Canada, there are only two studies, those of Fuss and Gupta (1981) and Baldwin and Gorecki (1986). The Fuss and Gupta study served as the starting point for our analysis. However Fuss and Gupta were constrained to using published data, which are available for a maximum of eight size groups. In order to increase the degrees of freedom, Fuss and Gupta pooled data for 1965, 1968, 1969 and 1970. They also assumed the price of each input to be identical for all establishments. Their results suggest that in the late 1960s, there were increasing returns in the 91 manufacturing industries they analysed. The study by Baldwin and Gorecki (1986), using a Cobb-Douglas value-added function with the same data as used in our analysis, reached the conclusion that there were increasing, constant and decreasing returns, respectively, in 52, 46 and 2 per cent of Canadian manufacturing industries, or 64, 32 and 4 per cent of total manufacturing value added for 1979.

As noted before, our results suggest there are increasing, constant and decreasing returns, respectively, in 57, 30 and 14 per cent of Canadian manufacturing industries, or 68, 25 and 7 per cent of total manufacturing output. Thus, our results indicate decreasing returns in a slightly larger proportion of industries than do the other two studies. The Fuss and Gupta results diverge by the absence of industries having constant returns to scale. This characteristic of the Fuss and Gupta analysis is, however, spurious since the procedure they used prevents the cost function from exhibiting constant returns.

Another summary comparison of the three studies can be made by calculating the weighted average scale elasticity implied by the regression equations. On this basis, Baldwin-Gorecki's primal estimates suggest that there is more scope for exploiting scale economies in Canadian manufacturing industries than suggested by our work and that of Fuss and Gupta. The weighted average scale elasticity is 1.17 in the Baldwin-Gorecki study compared to 1.06 in the Fuss-Gupta study and our work.[11] As noted earlier the scale elasticity is constant in the Baldwin-Gorecki study. In the Fuss-Gupta and our studies the scale elasticity is evaluated at one-half of MES.

The difference between the scale economy estimates obtained by Baldwin-Gorecki and this study depends heavily on the output concept used. A value added concept is used by Baldwin and Gorecki, while we used a gross output measure of production. The exclusion of intermediate inputs from output and costs should increase substantially the scale elasticity estimates since empirical and theoretical evidence indicate that, in general, no technical scale economies exist for intermediate inputs.[12]

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11. In all three studies the weights use to aggregates the industry estimates are 1979 gross output shares.

12. There are other basic differences between Baldwin-Gorecki and our study such as the functional form (homothetic vs. homogeneous), the type of function (cost vs. production) and the exclusion criteria applied to the data. However, at least in aggregate, these characteristics do not seem to be significant factors in explaining the divergence in the results.

Table 5: Scale Elasticity, 1979

Industry	Baldwin-Gorecki[1]		Robidoux-Lester
	Value Added	Gross Output	Gross Output
Bakeries	1.17	1.09	1.01
Confectionery	1.00	1.00	1.01
Throwsters, yarn, cloth mills	1.02	0.98	1.00
Sawmills and planing mills	1.31	1.22	1.02
Commercial printing	1.18	1.05	1.01
Metal stamping and pressing	1.34	1.09	1.08
Electrical major appliances	1.14	0.91	1.11
Electrical industrial equipment	1.00	0.98	1.01
Average	1.15	1.04	1.03

1. Cobb-Douglas production function. Source: Baldwin and Gorecki (1986), appendix C, Table C-7, p. 276.

The importance of the output measure used can be illustrated by comparing results from our study with secondary estimates obtained by Baldwin and Gorecki using a gross output function. Baldwin-Gorecki estimated this gross output production function for a subset of industries and the results are presented in Table 5 along with their basic value-added estimates and our results. The results indicate that value-added estimates are always higher than gross output estimates. Moreover, on average, the scale elasticity derived from the gross output function of Baldwin and Gorecki is virtually equal to our estimates for this sub-sample of industries.[13]

Another way to verify the importance of the output measure used is to approximate the gross output scale elasticity implied by the Baldwin-Gorecki estimate, assuming that no scale economies exist for intermediate inputs. Given that intermediate inputs account for 62 per cent of gross output in 1979, the Baldwin-Gorecki scale elasticity estimate of 1.17 implies a gross output scale elasticity of 1.06. With this adjustment, the aggregate scale elasticities derived from the three studies converge to the same value.

13. Robidoux (1987) reached the same conclusion by comparing the results obtained by Fuss and Gupta (1981) and Baldwin and Gorecki (1986) for 1970.

One question naturally arises: what is the correct measure of output in the context of sectoral analysis? First, the use of a value added function requires that value added and intermediate inputs be separable. The studies by Denny and May (1977) and Delorme and Lester (1986) reject this hypothesis for the Canadian manufacturing sector using time-series data. Although these studies do not use plant data, they are the only pieces of empirical evidence for the Canadian manufacturing industry. Second, from the firm's point of view, the costs pertinent to production decisions are total costs, not only the cost associated with primary inputs. Finally, although it could be sensible to use value added at the aggregate level in order to eliminate double counting, this motivation is obviously not relevant at the disaggregated level. Consequently, the estimation of a production or a cost function based on a gross output definition of production appears to be more appropriate for sectoral analysis.

4.4 Statistical Significance of Results

The estimations presented in the preceding sections result from a comparison of four different unit cost function specifications for each industry. Since the regression with the highest adjusted R^2 was chosen as the true unit cost curve, it is possible that coefficients associated with output or its inverse were not statistically significant using usual confidence level criteria. In other words, the finding of increasing or decreasing returns may not be statistically significant and it may not be possible to reject the hypothesis that returns are constant.

In this section we examine if the results are sensitive to statistical criteria used to determine the shape of the cost curve. Starting with the final form chosen by the adjusted R^2 criteria, all coefficients associated with output or its inverse that are not statistically significant are set to zero according to different confidence levels. This exercise will permit, *inter alia*, the evaluation of the statistical significance of the results, particularly the existence of decreasing returns to scale.

Table 6: Shape of the unit cost curve

Confidence Level[1]	Returns									
	increasing					constant	decreasing			
	H	L	S-	U	total	S	IH	S+	IU	total
Highest $\bar{R}^2$	45	8	19	11	83	44	8	4	8	20
10%	46	2	19	8	75	61	5	2	4	11
5%	41	1	18	5	65	77	3	2	0	5
1%	22	0	9	1	32	115	0	0	0	0

1. One-tail t-test.

The results obtained with different statistical scenarios are presented in Table 6. At a 10 per cent confidence level, the number of industries exhibiting decreasing returns to scale are reduced by almost fifty per cent. In contrast, in almost all industries where increasing returns to scale were identified, the results are statistically robust using the same confidence level. Similarly, at a 5 per cent level, the number of industries having decreasing returns is reduced from 20 to 5, whereas increasing returns still characterize more than 40 per cent of industries. Finally, at a 1 per cent confidence level, no industry exhibits decreasing returns and only one industry still has a U-shaped unit cost curve. Thus, we can conclude that decreasing returns obtained in the estimation process are partly spurious since they are not statistically significant for high confidence intervals.[14]

5. Methodological Problems and Assessment of Results

The results presented in this paper, taken at face value, suggest that rationalization of Canadian manufacturing structure could have raised overall efficiency by 2.7 per cent of GDP in 1979. However,

14. Consequently, for all aggregation of basic cost penalty and scale elasticity estimates presented in the annex and in Table 4 we assume constant returns in industries where decreasing returns to scale were obtained in the estimation process.

econometric estimates are subject to a number of potential biases and we argue in this section that the net result of these biases is likely to underestimate the importance of scale economies.

Many methodological problems have been associated with econometric estimates of scale economies in the industrial organization literature. (For a review, see Robidoux (1987)). Some of the more important are: the inability to control for differences in technology and capacity utilization rates; the failure to include prices for all inputs; approximating real output by the value of production; the simultaneity bias caused by treating output as exogenous; the definition of the cost saving achievable by exploiting scale economies; the regression fallacy; selection bias; and the homotheticity assumption.

The analysis presented here supposes that only input prices and the level and diversity of output influence costs; it is implicitly assumed that other factors are identical or constant for all plants. This is unlikely to be completely true. For example, there are probably differences in technology and capacity utilization rates among the various plants in an industry. However, the exclusion of plants with extreme shares of materials in total costs probably reduced the importance of this problem in our study. In addition, the results obtained with many exogenous variables used to detect and control, if necessary, for differences in capacity utilization rates suggest that no significant departure from the long-run unit cost curve exists in the data.[15]

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15. Since above- or below-normal utilization rates will raise production costs above minimum levels, the following four alternative proxies for capacity utilization were tested: absolute deviation of the inventory-to-shipments ratio from the industry average; absolute deviation of the number of hours worked by production worker from the industry average; absolute deviation of the ratio of unfilled orders to shipments from the industry average; dummy variable equalling 1 when unfilled orders are zero in plants normally having unfilled orders and when unfilled orders are non-zero in plants not normally having unfilled orders. In general, the coefficients associated with these variables were not statistically significant. Obviously, it is also possible that these variables are not good proxies for capacity utilization rates.

The analysis also assumes explicitly that the prices of homogenous or efficiency units of energy and materials are identical for all plants. If this hypothesis is not valid, omitting these price variables from the right hand side of the unit cost function will cause specification biases in the estimated coefficients. Under certain conditions,[16] omitting these prices will imply negative biases on estimated wage coefficients and positive bias on economies of scale (i.e. negative bias on α_2 and positive bias on α_3). Thus omitting the prices of energy and materials may lead to the result noted above that wage differentials across plants reflect, in general, differences in productivity when in fact the efficiency differentials are insufficient to compensate for higher wages. On the other hand, omitting these variables does not cause a bias towards constant returns to scale. However, this specification bias analysis is heavily dependant of the underlying hypothesis and we should keep in mind that the effect of omitted input prices is basically undetermined.

The cost function approach used assumes that the input prices and the level of production are exogenous and that firms minimize production costs. If the level of production is also a choice variable for producers resulting from a process of maximizing profits, then the estimated coefficients will all be potentially subject to simultaneity bias.[17] Another output-related problem can come from the fact that the

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16. It is assumed here that the correlation between the level of production and the wage rates is positive and that the correlation between the level of production, on the one hand, and the prices of energy and materials, on the other hand, is negative. Obviously, we also assume that prices of energy and materials have a positive effect on unit cost; i.e., the variance in prices do not reflect heterogeneous composition of input.

17. Formally, there will be no bias only if the correlation between the disturbance in the cost equation and that in the profit equation is zero (recursive system). Note also that endogeneity of output and the problem of variation in capacity utilization noted before are interrelated. In fact, the inequality between ex ante and ex post level of output implicitly suppose that output is stochastic.

level of real production is approximated by the value of production. This approach is not appropriate if output is homogeneous, but it is appropriate if differences in output prices account for quality differences.[18]

In contrast to the preceding potential problems where the effect on econometric estimates of scale economies is undeterminated, there are two factors that may give an upward bias to our estimates. The first comes from the definition of the cost saving achievable (CSA) parameter and is therefore specific to our study. This bias arises because the CSA is a measure of the cost penalty associated with non-optimal rather than sub-optimal plants only, since plants larger than the MES have not been excluded. However, as we noted before, eliminating completely the cost savings in industries having a U-shaped average cost curve has virtually no effect on the basic results. In addition, the CSA is calculated assuming that all plants are of optimal scale. Obviously, it is unlikely that all production will originate in plants of optimal size in response to a change in the economic environment.

A second source of potential upward bias is the regression fallacy problem noted by Friedman (1955).[19] Friedman's argument is based on the fact that effective production costs are not observable when the actual scale of production is different from the planned scale. According to the theory, firms minimize their variable costs in the short-run, but this process is not reflected in the cost data generally used and available. Under the hypothesis that the distribution of

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18. In theory, the product diversity index controls for heterogeneity of output. However, it is unlikely that this hedonic approach to the treatment of production diversity could totally eliminate the heterogeneity effect.

19. Many interpretations of the regression fallacy exist in the economic literature and are a source of much confusion. This situation results in part from the ambiguity of Friedman's (1955) basic presentation.

planned and transitory production in an industry are independent, plants with production scales higher the industry average production will have, on average, a positive transitory component and the reverse will be true for the other firms whose scale of production is lower than average.[20] Then, the ratio of observable costs to actual costs decreases, on average, with plant size so scale economies are biased upwards.

Consequently, assuming that production is partly stochastic, we shift from an abnormal capacity problem to a regression fallacy problem. However, this problem often associated with the econometric approach should be put in perspective. First, as in the case of excluding input prices, the conclusion of upwards bias is heavily dependant of the underlying hypothesis of independence between permanent and transitory components of production and is thus questionable on empirical grounds. Second, assuming that most of the discrepancy between observed costs and true costs come from capital costs, the estimation of a non-capital cost function will not be significantly affected by such problem, if it exists.

We turn now to factors that likely cause a downward bias on the economies of scale estimates: selection biases and the assumption of a homothetic production process.

Econometric analysis is an attempt to identify the long-run unit cost curve on the basis of actual cost-scale observations and it is, consequently, potentially affected by negative sample selection biases. First, as noted by Miller (1977), small plants are excluded of the sample on the basis of non-negative profit rule. In effect, if the market structure is characterized by reasonable competition and scale economies at the plant level, small plants will be excluded from the observed sample by market forces. In addition, the exclusion criteria we used eliminate many small establishments. Second, the possibility

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20. See Johnston (1958).

that optimally-sized plants do not exist for certain industries due to the small size of the Canadian market and international barriers to entry will also imply a negative bias on economies of scale estimates. The fact that some estimated cost curves do not have a minimum point reinforces the concern about selection bias at the upper end of the size distribution of plants.[21]

The homotheticity assumption may be also an important cause of bias in the results. Using a non-capital cost function is expected to yield true returns to scale only when the production process is homothetic. Limited micro-empirical evidence coming essentially from Haldi and Withcomb (1967) indicates that the production process is definitively not homothetic, at least in the U.S., but that this assumption could be a tolerable approximation when used to exclude capital from total costs in estimating a cost function.[22,23] According to their results, a non-capital cost function will create a relatively small negative bias on scale economy estimates. They obtained a scale elasticity of 1.56 for capital input and 1.47 for variable inputs, where variable inputs correspond to raw materials and labour. However, we may expect a higher bias from data incorporating all intermediate input costs.

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21. Unit cost curves that decline without limit occur in industries that account for almost 20 per cent of manufacturing output.

22. Some empirical evidence derived from time-series data exists also (see Fuss and Gupta (1981)), but as noted by Robidoux (1987), the pertinence of these macro results is questionable in the micro context.

23. Their results suggest that economies of scale are large for labour and capital inputs, limited for energy and virtually non-existent for raw materials. Thus, as indicated also by the preceding comparison between the Baldwin-Gorecki results and our own, excluding the materials cost from the total costs will imply a large positive bias on total scale economy estimates.

Using the homotheticity assumption in order to estimate a non-capital cost function will be appropriate if the capital/non-capital factor intensity is independent of plant size. However, if larger plants have production that is relatively less capital-intensive (or capital saving), the scale economies estimated with a non-capital cost function will be negatively biased.[24] The size of the total bias will be proportional to the extent to which the homotheticity assumption does not reflect the true production process and will be more important in capital- and materials-intensive industries.[25]

In sum, many methodological problems can potentially affect the scale economy estimates presented in this paper and evaluating if they are over- or under-estimates of the true cost-scale relation is primarily an empirical question. However, given the potential importance of the selection and homotheticity biases, econometric estimates are expected to be more likely an under-estimation of true economies of scale.

5. Conclusion

This paper has evaluated the existence and extent of scale economies in Canadian manufacturing industries using a homothetic average non-capital cost function and plant-level data. The results suggest that there are increasing returns to scale in a majority of manufacturing industries, but also that a significant number of industries are characterized by constant returns.

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24. The plant-specific capital statistics provided by Griliches and Ringstad (1971) suggest this the case in many Norwegian manufacturing industries.

25. Using the two-digit classification, the correlation between the cost saving achievable, on the one hand, and the capital and materials cost shares, on the other hand, is respectively -0.1 and -0.3.

The results suggest that the cost penalty associated with sub-optimal production is quite substantial. If all industries exhibiting increasing returns to scale had operated at the MES in 1979, production costs in these industries would have been roughly 6 per cent lower or 4 per cent lower for all industries examined. Moreover, the econometric methodology used likely understates the true potential scope for cost saving through larger production scales. The results also indicate that MES is a small fraction of total output in most industries analyzed.

Finally, although wage rates and product diversity have no impact on unit cost in most industries, some specific industries and, by inference, the aggregate results are significantly affected by the inclusion of these variables. However, we should emphasize that the wage specification error is not a general problem since wage differentials across plants reflect differences in productivity, as human capital or efficiency wage theories predict, in the majority of industries examined.

Annex: Econometric Results for Two- and Four-Digit Industries - 1979

TABLE A1: Distribution of Four-Digit Industries According to Returns to scale and Major Industry Grouping.

TABLE A2: Distribution of Four-Digit Industries by Shape of the Long-Run Average Cost Curve and by Major Industry Grouping: Model A.

TABLE A3: Distribution of Four-Digit Industries by Shape of the Long-Run Average Cost Curve and by Major Industry Grouping: Model B.

TABLE A4: Statistics and Measures Derived from Estimates of the Long-Run Average Cost Cure by Major Grouping: Model A.

TABLE A5: Statistics and Measures Derived from Estimates of the Long-Run Average Cost Curve by Major Grouping: Model B.

TABLE A6: Statistics and Measures Derived from Estimates of the Long-Run Average Cost Curve by Major Grouping: Comparison of Models A and B.

TABLE A7: Statistics Derived from Estimates of the Long-Run Average Cost Curve for Four-Digit Industries: Model A.

TABLE A8: Statistics Derived from Estimates of the Long-Run Average Cost Curve for Four-Digit Industries: Model B.

TABLE A9: Estimated Coefficients of the Long-Run Average Cost Curve: Model A.

TABLE A1: DISTRIBUTION OF FOUR-DIGIT INDUSTRIES ACCORDING TO RETURNS TO SCALE AND MAJOR INDUSTRY GROUPING (1), (2)

	INDUSTRY	MODEL A			MODEL B		
		INCREASING	CONSTANT	DECREASING	INCREASING	CONSTANT	DECREASING
1	FOOD AND BEVERAGE	12 (66.7)	3 (16.7)	3 (16.7)	9 (50.0)	6 (33.3)	3 (16.7)
2	TOBACCO	-	1 (100.0)	-	1 (100.0)	-	-
3	RUBBER AND PLASTICS	1 (33.3)	1 (33.3)	1 (33.3)	1 (33.3)	1 (33.3)	1 (33.3)
4	LEATHER	2 (50.0)	2 (50.0)	-	2 (50.0)	2 (50.0)	-
5	TEXTILE	6 (50.0)	3 (25.0)	3 (25.0)	6 (50.0)	3 (25.0)	3 (25.0)
6	KNITTING MILLS	3 (100.0)	-	-	3 (100.0)	-	-
7	CLOTHING	3 (42.9)	3 (42.9)	1 (14.3)	5 (71.4)	2 (28.6)	-
8	WOOD	7 (58.3)	5 (41.7)	-	9 (75.0)	2 (16.7)	1 (8.3)
9	FURNITURE AND FIXTURES	3 (75.0)	1 (25.0)	-	3 (75.0)	-	1 (25.0)
10	PAPER AND ALLIED	4 (66.7)	2 (33.3)	-	2 (33.3)	2 (33.3)	2 (33.3)
11	PRINTING, PUBLISHING	2 (66.7)	1 (33.3)	-	3 (100.0)	-	-
12	PRIMARY METAL	1 (14.3)	3 (42.9)	3 (42.9)	2 (28.6)	4 (57.1)	1 (14.3)
13	METAL FABRICATING	10 (90.9)	1 (9.1)	-	10 (90.9)	1 (9.1)	-
14	MACHINERY	1 (25.0)	3 (75.0)	-	1 (25.0)	1 (25.0)	2 (50.0)
15	TRANSPORTATION EQUIPMENT	4 (44.4)	3 (33.3)	2 (22.2)	4 (44.4)	2 (22.2)	3 (33.3)
16	ELECTRICAL	7 (87.5)	-	1 (12.5)	5 (62.5)	1 (12.5)	2 (75.0)
17	NON-METALLIC MINERAL	7 (53.8)	4 (30.8)	2 (15.4)	5 (38.5)	5 (38.5)	3 (23.1)
18	PETROLEUM AND COAL	1 (50.0)	-	1 (50.0)	1 (50.0)	-	1 (50.0)
19	CHEMICALS	6 (60.0)	3 (30.0)	1 (10.0)	8 (80.0)	2 (20.0)	-
20	MISCELLANEOUS	3 (30.0)	5 (50.0)	2 (20.0)	4 (40.0)	3 (30.0)	3 (30.0)
	TOTAL	83 (56.5)	44 (29.9)	20 (13.6)	84 (57.1)	37 (25.2)	26 (17.7)
	PERCENTAGE OF TOTAL MANUFACTURING PRODUCTION	68.2%	24.8%	6.9%	59.0%	20.9%	20.1 %

1. ( ): PERCENTAGE OF TOTAL FOR A GIVEN INDUSTRY.

2. INDUSTRIES WITH U-SHAPED AVERAGE COST CURVES ARE CONSIDERED TO EXHIBIT INCREASING RETURNS TO SCALE WHILE INDUSTRIES WITH IU-SHAPED COST CURVES ARE CONSIDERED TO EXHIBIT DECREASING RETURNS TO SCALE.

TABLE A2: DISTRIBUTION OF FOUR-DIGIT INDUSTRIES BY SHAPE OF THE LONG-RUN AVERAGE COST CURVE AND BY MAJOR INDUSTRY GROUPING: MODEL A (1), (2)

	INDUSTRY	H	L	U	S-	S	S+	IH	IU
1	FOOD AND BEVERAGE	4 (22.2)	3 (16.7)	1 (5.6)	4 (22.2)	3 (16.7)	-	2 (11.1)	1 (5.6)
2	TOBACCO	-	-	-	-	1 (100.0)	-	-	-
3	RUBBER AND PLASTICS	1 (33.3)	-	-	-	1 (33.3)	-	-	1 (33.3)
4	LEATHER	2 (50.0)	-	-	-	2 (50.0)	-	-	-
5	TEXTILE	1 (8.3)	-	1 (8.3)	4 (33.3)	3 (25.0)	-	1 (8.3)	2 (16.6)
6	KNITTING MILLS	2 (66.6)	1 (33.3)	-	-	-	-	-	-
7	CLOTHING	1 (14.3)	-	-	2 (28.6)	3 (42.9)	1 (14.3)	-	-
8	WOOD	5 (41.7)	1 (8.3)	1 (8.3)	-	5 (41.7)	-	-	-
9	FURNITURE AND FIXTURES	2 (50.0)	-	1 (25.0)	-	1 (25.0)	-	-	-
10	PAPER AND ALLIED	1 (16.7)	1 (16.7)	2 (33.3)	-	2 (33.3)	-	-	-
11	PRINTING, PUBLISHING	2 (66.6)	-	-	-	1 (33.3)	-	-	-
12	PRIMARY METAL	-	-	1 (14.3)	-	3 (42.9)	2 (28.6)	1 (14.3)	-
13	METAL FABRICATING	7 (63.6)	-	1 (9.1)	2 (18.2)	1 (9.1)	-	-	-
14	MACHINERY	1 (25.0)	-	-	-	3 (75.0)	-	-	-
15	TRANSPORTATION EQUIPMENT	1 (33.3)	-	-	1 (11.1)	3 (33.3)	-	1 (11.1)	1 (11.1)
16	ELECTRICAL	5 (62.5)	-	-	2 (25.0)	-	-	1 (12.5)	-
17	NON-METALLIC MINERAL	2 (15.4)	-	2 (15.4)	3 (23.1)	4 (30.8)	1 (7.8)	-	1 (7.8)
18	PETROLEUM AND COAL	1 (50.0)	-	-	-	-	-	1 (50.0)	-
19	CHEMICALS	5 (50.0)	1 (10.0)	-	-	3 (30.0)	-	-	1 (10.0)
20	MISCELLANEOUS	-	1 (10.0)	1 (10.0)	1 (10.0)	5 (50.0)	-	1 (10.0)	1 (10.0)
	TOTAL	45 (30.6)	8 (5.4)	11 (7.5)	19 (12.9)	44 (29.9)	4 (2.7)	8 (5.4)	8 (5.4)

1. ( ): PERCENTAGE OF TOTAL FOR A GIVEN INDUSTRY.

2. SEE TEXT TABLE 1 FOR A DESCRIPTION OF SHAPE SYMBOLS.

TABLE A3: DISTRIBUTION OF FOUR-DIGIT INDUSTRIES BY SHAPE OF THE LONG-RUN AVERAGE COST CURVE AND BY MAJOR INDUSTRY GROUPING: MODEL B (1), (2)

	INDUSTRY	H	L	U	S-	S	S+	IH	IU
1	FOOD AND BEVERAGE	4 (22.2)	-	-	5 (27.7)	6 (33.3)	1 (5.5)	1 (5.5)	1 (5.5)
2	TOBACCO	-	-	-	1 (100.0)	-	-	-	-
3	RUBBER AND PLASTICS	1 (33.3)	-	-	-	1 (33.3)	-	1 (33.3)	-
4	LEATHER	2 (50.0)	-	-	-	2 (50.0)	-	-	-
5	TEXTILE	1 (8.3)	-	3 (25.0)	1 (16.7)	3 (25.0)	-	2 (16.7)	1 (8.3)
6	KNITTING MILLS	2 (66.6)	-	-	1 (33.3)	-	-	-	-
7	CLOTHING	-	-	2 (28.6)	3 (42.9)	2 (28.6)	-	-	-
8	WOOD	4 (33.3)	1 (8.3)	2 (16.7)	2 (16.7)	2 (16.7)	-	1 (8.3)	-
9	FURNITURE AND FIXTURES	2 (50.0)	-	1 (25.0)	-	-	-	-	1 (25.0)
10	PAPER AND ALLIED	-	1 (16.7)	1 (16.7)	-	2 (33.3)	-	1 (16.7)	1 (16.7)
11	PRINTING, PUBLISHING	2 (66.6)	-	1 (33.3)	-	-	-	-	-
12	PRIMARY METAL	1 (14.3)	-	1 (14.3)	-	4 (57.1)	1 (14.3)	-	-
13	METAL FABRICATING	4 (36.4)	1 (9.1)	3 (27.3)	2 (18.2)	1 (9.1)	-	-	-
14	MACHINERY	1 (25.0)	-	-	-	1 (25.0)	1 (25.0)	1 (25.0)	-
15	TRANSPORTATION EQUIPMENT	2 (22.2)	-	1 (11.1)	1 (11.1)	2 (22.2)	2 (22.2)	1 (11.1)	-
16	ELECTRICAL	3 (37.5)	1 (12.5)	-	1 (12.5)	1 (12.5)	-	1 (12.5)	1 (12.5)
17	NON-METALLIC MINERAL	2 (15.4)	-	2 (15.4)	1 (7.7)	5 (38.5)	1 (7.7)	-	2 (15.4)
18	PETROLEUM AND COAL	1 (50.0)	-	-	-	-	-	-	1 (50.0)
19	CHEMICALS	6 (60.0)	-	1 (10.0)	1 (10.0)	2 (20.0)	-	-	-
20	MISCELLANEOUS	2 (20.0)	-	-	2 (20.0)	3 (30.0)	1 (10.0)	1 (10.0)	1 (10.0)
	TOTAL	40 (27.2)	4 (2.7)	18 (12.2)	22 (15.0)	37 (25.2)	7 (4.8)	10 (6.8)	9 (16.1)

1. ( ): PERCENTAGE OF TOTAL FOR A GIVEN INDUSTRY.

2. SEE TEXT TABLE 1 FOR A DESCRIPTION OF SHAPE SYMBOLS.

TABLE A4: STATISTICS AND MEASURES DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE BY MAJOR GROUPING : MODEL A (1)

	INDUSTRY	INDUSTRY PRODUCTION/TOTAL PRODUCTION		ESTIMATED MES (2)	MES/TOTAL INDUSTRY PRODUCTION (2)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (2)		COST SAVING ACHIEVABLE (2)		SCALE ELASTICITY AT ONE-HALF MES (2)	
		%		(MILLIONS)	%	%		%			
		ALL	IRSI	IRSI	IRSI	ALL	IRSI	ALL	IRSI	ALL	IRSI
1	FOOD AND BEVERAGE	16.93	10.59	75.90	1.99	4.11	6.56	4.08	6.53	1.19	1.31
2	TOBACCO PRODUCTS	0.53	NA	NA	NA	0.00	NA	0.00	NA	1.00	NA
3	RUBBER AND PLASTICS PROD.	2.15	1.21	17.56	0.91	0.44	0.77	1.49	2.65	1.01	1.02
4	LEATHER	0.64	0.47	20.09	5.01	0.50	0.68	1.19	1.64	1.01	1.01
5	TEXTILE	2.47	1.20	101.70	17.97	3.90	8.07	3.75	7.76	1.04	1.09
6	KNITTING MILLS	0.50	0.50	13.19	4.90	2.20	2.20	2.56	2.56	1.03	1.03
7	CLOTHING	1.94	1.59	13.23	1.66	2.90	3.54	2.18	2.67	1.04	1.04
8	WOOD	5.42	5.10	13.60	1.21	0.79	0.84	4.03	4.29	1.02	1.02
9	FURNITURE AND FIXTURES	1.18	1.15	8.55	1.28	1.18	1.21	3.35	3.45	1.03	1.03
10	PAPER AND ALLIED IND.	7.89	6.88	148.98	1.95	8.16	9.36	5.71	6.56	1.10	1.11
11	PRINTING, PUBLISHING	2.25	2.12	36.75	2.43	0.45	0.48	5.38	5.73	1.01	1.01
12	PRIMARY METAL	8.51	0.65	28.36	2.75	0.14	1.87	0.72	9.47	1.00	1.06
13	METAL FABRICATING	5.34	5.12	25.19	4.43	2.75	2.88	4.01	4.19	1.04	1.05
14	MACHINERY	4.61	3.02	33.85	0.70	0.24	0.36	2.11	3.22	1.00	1.01
15	TRANSPORTATION EQUIPMENT	16.19	10.73	1067.55	7.00	0.13	0.20	5.06	7.64	1.00	1.00
16	ELECTRICAL PRODUCTS	4.19	3.52	64.86	5.86	5.31	6.32	6.54	7.78	1.06	1.07
17	NON-METALLIC MINERAL PROD.	2.51	1.56	34.16	8.25	4.86	7.81	5.37	8.61	1.08	1.13
18	PETROLEUM AND COAL PROD.	8.01	7.92	696.91	5.52	0.58	0.59	1.33	1.34	1.01	1.01
19	CHEMICAL	6.57	3.69	80.98	8.86	1.30	2.31	2.00	3.56	1.02	1.03
20	MISCELLANEOUS	2.15	1.24	21.02	2.48	3.95	6.85	6.69	11.61	1.05	1.09
21	TOTAL	100.00	68.23	292.98	4.74	2.34	3.42	3.69	5.41	1.06	1.08

1. ALL CORRESPONDS TO ALL INDUSTRIES EXAMINED AND IRSI CORRESPONDS TO INDUSTRIES EXHIBITING INCREASING RETURNS TO SCALE.

2. NUMBER CORRESPONDS TO WEIGHTED AVERAGE OF THE APPROPRIATE FOUR-DIGIT LEVEL ESTIMATES, WITH THE WEIGHTS BEING GROSS OUTPUT SHARES.

TABLE A5: STATISTICS AND MEASURES DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE BY MAJOR GROUPING: MODEL B (1)

	INDUSTRY	INDUSTRY PRODUCTION/TOTAL		ESTIMATED MES (2)	MES/TOTAL INDUSTRY PRODUCTION (2)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (2)		COST SAVING ACHIEVABLE (2)		SCALE ELASTICITY AT ONE-HALF MES (2)	
		%		(MILLIONS)	%	%		%			
		ALL	IRSI	IRSI	IRSI	ALL	IRSI	ALL	IRSI	ALL	IRSI
1	FOOD AND BEVERAGE	16.93	7.06	65.79	5.08	2.42	5.81	2.26	5.43	1.03	1.06
2	TOBACCO	0.53	0.53	208.86	24.69	15.06	15.06	11.19	11.19	1.16	1.16
3	RUBBER AND PLASTICS	2.15	1.21	17.56	0.91	0.45	0.81	1.80	3.20	1.01	1.02
4	LEATHER	0.64	0.47	20.09	5.01	0.49	0.68	1.29	1.77	1.01	1.01
5	TEXTILE	2.47	0.66	120.23	21.86	2.08	7.76	2.20	8.20	1.04	1.14
6	KNITTING MILLS	0.50	0.50	13.19	4.90	2.27	2.27	2.65	2.65	1.04	1.04
7	CLOTHING	1.94	1.76	13.77	1.93	9.70	10.71	13.45	14.84	1.11	1.12
8	WOOD	5.42	5.12	8.63	0.93	0.85	0.91	4.21	4.46	1.02	1.02
9	FURNITURE AND FIXTURES	1.18	1.15	8.53	1.27	1.05	1.08	3.17	3.27	1.03	1.03
10	PAPER AND ALLIED	7.89	6.22	162.46	1.75	6.45	8.18	4.95	6.27	1.07	1.09
11	PRINTING, PUBLISHING	2.25	2.25	11.67	0.76	0.53	0.53	4.68	4.68	1.01	1.01
12	PRIMARY METAL	8.51	3.11	216.34	5.91	0.50	1.38	1.81	4.94	1.01	1.03
13	METAL FABRICATING	5.34	5.12	14.55	2.88	1.56	1.63	4.12	4.30	1.03	1.03
14	MACHINERY	4.61	3.02	33.85	0.70	0.24	0.36	2.27	3.46	1.00	1.01
15	TRANSPORTATION EQUIPMENT	16.19	1.72	334.17	19.74	0.07	0.63	0.32	3.00	1.00	1.01
16	ELECTRICAL	4.19	2.74	64.21	5.15	2.65	4.06	3.30	5.05	1.03	1.05
17	NON-METALLIC MINERAL	2.51	1.09	23.83	7.12	3.63	8.35	2.46	5.66	1.15	1.35
18	PETROLEUM AND COAL	8.01	7.92	696.91	5.52	0.32	0.33	0.71	0.72	1.01	1.01
19	CHEMICALS	6.57	6.33	71.47	6.44	1.42	1.47	5.07	5.26	1.03	1.03
20	MISCELLANEOUS	2.15	1.01	27.55	6.63	3.17	6.74	2.57	5.47	1.04	1.09
	TOTAL	100.00	58.97	159.88	4.64	1.87	3.17	2.75	4.67	1.03	1.05

1. ALL CORRESPONDS TO ALL INDUSTRIES EXAMINED AND IRSI CORRESPONDS TO INDUSTRIES EXHIBITING INCREASING RETURNS TO SCALE.

2. NUMBER CORRESPONDS TO WEIGHTED AVERAGE OF THE APPROPRIATE FOUR-DIGIT LEVEL ESTIMATES, WITH THE WEIGHTS BEING GROSS OUTPUT SHARES.

TABLE A6: STATISTICS AND MEASURES DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE BY MAJOR GROUPING: COMPARISON OF MODELS A AND B (1)

		PERCENTAGE OF IND. OUTPUT PRODUCED IN IRSI (2)		ESTIMATED MES (IRSI ONLY) (MILLIONS)		MES IN PERCENTAGE OF TOTAL INDUSTRY PRODUCTION (IRSI ONLY)		AVERAGE COST DISADVANTAGE AT ONE-HALF MES (ALL IND.)		COST SAVING ACHIEVABLE (ALL IND.)	
		A	B	A	B	A	B	A	B	A	B
1	FOOD AND BEVERAGE	62.57	41.68	75.90	65.79	4.99	5.08	4.11	2.42	4.08	2.26
2	TOBACCO PRODUCTS	0.00	100.00	NA	208.86	NA	24.69	0.00	15.06	0.00	11.19
3	RUBBER AND PLASTICS PROD.	56.26	56.26	17.56	17.56	0.91	0.91	0.44	0.45	1.49	1.80
4	LEATHER	72.57	72.57	20.09	20.09	5.01	5.01	0.50	0.49	1.19	1.29
5	TEXTILE	46.34	26.78	101.70	120.23	17.97	21.86	3.90	2.08	3.75	2.20
6	KNITTING MILLS	100.00	100.00	13.19	13.19	4.90	4.90	2.20	2.27	2.56	2.65
7	CLOTHING	81.95	90.64	13.23	13.77	1.66	1.93	2.90	9.70	2.17	13.45
8	WOOD	94.00	94.40	13.60	8.63	1.21	0.93	0.79	0.85	4.03	4.21
9	FURNITURE AND FIXTURES	97.16	97.16	8.55	8.53	1.28	1.27	1.18	1.05	3.35	3.17
10	PAPER AND ALLIED IND.	87.14	78.84	148.98	162.46	1.95	1.75	8.16	6.45	5.71	4.95
11	PRINTING, PUBLISHING	93.85	100.00	36.75	11.67	2.43	0.76	0.45	0.53	5.38	4.68
12	PRIMARY METAL	7.58	36.53	28.36	216.34	2.75	5.91	0.14	0.50	0.72	1.81
13	METAL FABRICATING	95.79	95.79	25.19	14.55	4.43	2.88	2.75	1.56	4.01	4.12
14	MACHINERY	65.48	65.48	33.85	33.85	0.70	0.70	0.24	0.24	2.11	2.27
15	TRANSPORTATION EQUIPMENT	66.25	10.60	1067.55	334.17	7.00	19.74	0.13	0.07	5.06	0.32
16	ELECTRICAL PRODUCTS	83.98	65.41	64.86	64.21	5.86	5.15	5.31	2.65	6.47	3.30
17	NON-METALLIC MINERAL PROD.	62.32	43.52	34.16	23.83	8.25	7.12	4.86	3.63	5.37	2.46
18	PETROLEUM AND COAL PROD.	98.78	98.78	696.91	696.91	5.52	5.52	0.58	0.32	1.33	0.71
19	CHEMICAL	56.10	96.26	80.98	71.47	8.86	6.44	1.30	1.42	1.36	5.07
20	MISCELLANEOUS	57.63	47.00	21.02	27.55	2.48	6.63	3.95	3.17	6.69	2.57
	TOTAL	68.23	58.97	292.98	159.88	4.74	4.64	2.34	1.87	3.65	2.75

1. NUMBER CORRESPONDS TO WEIGHTED AVERAGE OF THE APPROPRIATE FOUR-DIGIT LEVEL ESTIMATES, WITH THE WEIGHTS BEING GROSS OUTPUT SHARES.
2. IRSI CORRESPONDS TO INDUSTRIES EXHIBITING INCREASING RETURNS TO SCALE.

TABLE A7: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL A (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
1. FOOD AND BEVERAGE								
1011	SLAUGHTERING AND MEAT PROCESSORS	4.27	S	NA	NA	0.00	0.00	1.00
1012	POULTRY PROCESSORS	0.64	IH	NA	NA	0.00	0.00	1.00
1020	FISH PRODUCTS	0.94	S-	24.30	1.61	9.02	7.86	1.09
1031	FRUIT & VEG. CANNERS & PRESERVERS	0.78	H	58.52	4.72	0.75	1.56	1.02
1032	FROZEN FRUIT & VEGETABLE PROCESSORS	0.21	S	NA	NA	0.00	0.00	1.00
1040	DAIRY PRODUCTS	2.72	L	103.10	2.37	1.95	3.30	1.02
1050	FLOUR & BREAKFAST CEREAL PRODS.	0.55	IU	NA	NA	0.00	0.00	1.00
1060	FEED	1.22	S-	27.90	1.43	8.40	5.54	1.09
1071	BISCUITS	0.21	S-	51.60	15.58	13.71	11.15	1.15
1072	BAKERIES	0.66	H	26.74	2.54	0.32	2.56	1.01
1081	CONFECTIONERY	0.39	H	70.26	11.21	0.53	2.69	1.01
1082	CANE AND BEET SUGAR PROCESSORS	0.31	S-	98.29	20.15	10.07	12.09	1.11
1083	VEGETABLE OIL MILLS	0.42	U	70.32	10.61	33.42	11.59	7.41
1089	MISC. FOOD PROCESSORS NES	1.73	L	109.45	3.96	7.38	10.72	1.08
1091	SOFT DRINK	0.67	IH	NA	NA	0.00	0.00	1.00
1092	DISTILLERIES	0.42	H	92.41	13.63	1.15	4.13	1.02
1093	BREWERIES	0.70	L	110.68	9.97	16.32	15.61	1.19
1094	WINERIES	0.09	S	NA	NA	0.00	0.00	1.00
2. TOBACCO								
1530	TOBACCO PRODUCTS MANUFACTURERS	0.53	S	NA	NA	0.00	0.00	1.00
3. RUBBER AND PLASTICS								
1623	TIRE AND TUBE	NA	S	NA	NA	NA	NA	NA
1629	MISC. RUBBER PRODUCTS	NA	IU	NA	NA	NA	NA	NA
1650	PLASTICS FABRICATING NES	1.21	H	17.56	0.91	0.77	2.65	1.02
4. LEATHER								
1720	LEATHER TANNERIES	0.14	S	NA	NA	0.00	0.00	1.00
1740	SHOE	0.37	H	21.14	3.58	0.79	1.73	1.02
1792	BOOT AND SHOE FINDINGS	0.03	S	NA	NA	0.00	0.00	1.00
1799	MISC. LEATHER PRODUCTS	0.10	H	16.03	10.51	0.29	1.30	1.01
5. TEXTILE								
1810	COTTON YARN AND CLOTH	0.38	S-	204.38	33.57	9.95	9.57	1.10
1820	WOOL YARN AND CLOTH	0.14	S	NA	NA	0.00	0.00	1.00
1831	FIBRE AND FILAMENT YARN	0.36	S-	54.86	9.59	8.78	8.47	1.09
1832	THROWSTERS, SPUN YARN & CLOTH	0.45	IH	NA	NA	0.00	0.00	1.00
1852	PRESSED AND PUNCHED FELT	0.02	U	3.47	10.94	12.74	10.14	1.56
1860	CARPET, MAT AND RUG	0.35	S-	66.81	12.00	5.48	5.31	1.06
1871	COTTON AND JUTE BAGS	0.03	S	NA	NA	0.00	0.00	1.00
1872	CANVAS PRODUCTS	0.05	S-	4.98	6.59	8.48	6.70	1.09
1880	AUTOMOBILE FABRIC ACCESSORIES	0.26	S	NA	NA	0.00	0.00	1.00
1892	NARROW FABRIC MILLS	0.04	H	8.37	13.32	3.55	5.46	1.08
1893	EMBROIDERY, PLEATING, HEMSTITCHING	0.02	IU	NA	NA	0.00	0.00	1.00
1899	MISCELLANEOUS TEXTILE NES	0.38	IU	NA	NA	0.00	0.00	1.00

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TABLE A7: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL A (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
6. KNITTING MILLS								
2310	HOSIERY	0.09	L	11.38	7.85	6.18	4.68	1.06
2391	KNITTED FABRIC	0.18	H	16.98	5.86	1.53	2.47	1.03
2392	OTHER KNITTING	0.23	H	10.90	2.98	1.16	1.79	1.02
7. CLOTHING								
2431	MEN'S CLOTHING	0.75	H	16.18	1.35	0.34	0.00	1.01
2441	WOMEN'S CLOTHING	0.78	S-	10.18	0.82	3.27	2.81	1.03
2450	CHILDREN'S CLOTHING	0.16	S	NA	NA	0.00	0.00	1.00
2460	FUR GOODS	0.13	S+	NA	NA	0.00	0.00	1.00
2480	FOUNDATION GARMENT	0.06	S-	15.77	16.16	46.42	33.63	1.62
2492	HAT AND CAP	0.02	S	NA	NA	0.00	0.00	1.00
2499	MISCELLANEOUS CLOTHING NES	0.04	S	NA	NA	0.00	0.00	1.00
8. WOOD								
2511	SHINGLE MILLS	0.07	S	NA	NA	0.00	0.00	1.00
2513	SAWMILLS AND PLANNING MILLS	3.54	U	10.70	0.19	0.52	4.44	1.02
2520	VENEER AND PLYWOOD MILLS	0.59	H	34.44	3.67	0.70	4.97	1.01
2541	SASH, DOOR AND OTHER MILLWORK NES	0.52	H	10.50	1.26	0.81	1.88	1.02
2543	PRE-FABRICATED BLDGS. (WOOD FRAME)	0.20	H	14.31	4.58	2.67	6.30	1.06
2544	WOODEN KITCHEN CABINETS	0.12	L	6.97	3.68	7.78	7.64	1.10
2560	WOODEN BOX	0.10	S	NA	NA	0.00	0.00	1.00
2580	COFFIN AND CASKET	0.02	H	3.34	11.76	2.01	2.01	1.04
2591	WOOD PRESERVATION	0.08	S	NA	NA	0.00	0.00	1.00
2592	WOOD HANDLES AND TURNING	0.02	S	NA	NA	0.00	0.00	1.00
2593	PARTICLE BOARD	0.11	H	18.29	10.34	1.14	0.37	1.02
2599	MISCELLANEOUS WOOD NES	0.04	S	NA	NA	0.00	0.00	1.00
9. FURNITURE AND FIXTURES								
2619	HOUSEHOLD FURNITURE NES	0.63	H	9.83	0.98	0.70	2.92	1.01
2640	OFFICE FURNITURE	0.19	U	6.17	2.08	2.30	4.69	1.07
2660	MISC. FURNITURE AND FIXTURE	0.33	H	7.46	1.40	1.57	3.76	1.03
2680	ELECTRIC LAMP AND SHADE	0.03	S	NA	NA	0.00	0.00	1.00
10. PAPER AND ALLIED								
2710	PULP AND PAPER MILLS	5.97	L	169.12	1.77	10.36	6.97	1.11
2720	ASPHALT ROOFING	0.17	U	17.98	6.76	10.30	8.13	1.42
2731	FOLDING CARTON AND SET-UP BOX	0.25	U	5.10	1.26	1.98	5.34	1.06
2732	CORRUGATED BOX	0.49	H	21.90	2.81	0.69	1.58	1.01
2733	PAPER AND PLASTIC BAG	0.32	S	NA	NA	0.00	0.00	1.00
2740	MISCELLANEOUS PAPER CONVERTERS	0.70	S	NA	NA	0.00	0.00	1.00
11. PRINTING, PUBLISHING AND ALLIED								
2860	COMMERCIAL PRINTING	1.24	H	15.58	0.79	0.65	3.34	1.01
2870	PLATEMAKING, TYPESETTING ETC.	0.14	S	NA	NA	0.00	0.00	1.00
2890	PUBLISHING AND PRINTING	0.88	H	66.64	4.76	0.25	9.12	1.00

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TABLE A7: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL A (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
12. PRIMARY METAL								
2910	IRON AND STEEL MILLS	3.77	S	NA	NA	0.00	0.00	1.00
2920	STEEL PIPE AND TUBE MILLS	0.49	S+	NA	NA	0.00	0.00	1.00
2940	IRON FOUNDRIES	0.35	S	NA	NA	0.00	0.00	1.00
2950	SMELTING AND REFINING	2.46	S	NA	NA	0.00	0.00	1.00
2960	ALUMINUM ROLLING, CASTING ETC.	0.65	U	28.36	2.75	1.87	9.47	1.06
2970	COPPER & COPPER ALLOY ROLLING ETC.	0.38	IH	NA	NA	0.00	0.00	1.00
2980	METAL ROLLING, CASTING ETC. NES	0.41	S+	NA	NA	0.00	0.00	1.00
13. METAL FABRICATING								
3010	BOILER AND PLATE WORKS	0.39	H	107.27	17.10	0.13	8.73	1.00
3020	FAB. STRUCTURAL METAL	0.75	H	33.14	2.76	0.39	2.45	1.01
3031	METAL DOOR AND WINDOW	0.32	H	10.71	2.10	0.90	2.19	1.02
3039	ORNAMENT & ARCHITECTURAL METAL NES	0.30	S-	23.06	4.88	7.04	5.86	1.07
3042	METAL STAMPING AND PRESSING	1.48	U	4.11	0.17	3.74	2.13	1.08
3051	FASTENER	0.14	S-	73.87	33.54	17.54	18.13	1.19
3059	WIRE AND WIRE PRODUCTS NES	0.09	H	63.82	46.86	0.26	3.93	1.01
3060	HARDWARE, TOOL AND CULTERY	0.56	H	16.90	1.88	5.11	6.83	1.06
3070	HEATING EQUIPMENT	0.23	S	NA	NA	0.00	0.00	1.00
3080	MACHINE SHOPS	0.27	H	6.62	1.55	2.17	6.29	1.04
3090	MISC. METAL FABRICATING	0.82	H	22.48	1.71	0.69	2.68	1.01
14. MACHINERY								
3110	AGRICULTURAL IMPLEMENT	0.84	S	NA	NA	0.00	0.00	1.00
3150	MISC. MACHINERY AND EQUIPMENT	3.02	H	33.85	0.70	0.36	3.22	1.01
3160	COMMERCIAL REFRIG. AIR COND.	0.21	S	NA	NA	0.00	0.00	1.00
3180	OFFICE AND STORE MACHINERY	0.53	S	NA	NA	0.00	0.00	1.00
15. TRANSPORTATION EQUIPMENT								
3210	AIRCRAFT & AIRCRAFT PARTS	1.13	S	NA	NA	0.00	0.00	1.00
3230	MOTOR VEHICLE	10.14	H	1128.00	6.97	0.10	7.72	1.00
3241	TRUCK BODY	0.19	S	NA	NA	0.00	0.00	1.00
3242	NON-COMMERCIAL TRAILER	0.28	H	20.22	4.53	1.06	2.38	1.02
3243	COMMERCIAL TRAILER	0.22	H	39.73	11.16	0.79	9.96	1.02
3250	MOTOR VEHICLE PARTS & ACCESSORIES	2.90	S	NA	NA	0.00	0.00	1.00
3260	RAILROAD ROLLING STOCK	0.71	IU	NA	NA	0.00	0.00	1.00
3270	SHIPBUILDING AND REPAIR	0.54	IH	NA	NA	0.00	0.00	1.00
3280	BOATBUILDING AND REPAIR	0.09	S-	11.20	8.17	7.75	9.27	1.08
16. ELECTRICAL								
3310	SMALL ELECTRICAL APPLIANCES	0.22	H	22.68	6.48	0.58	2.85	1.01
3320	MAJOR APPLIANCES	0.56	S-	91.52	10.25	10.02	9.77	1.11
3330	LIGHTING FIXTURES	0.13	H	15.23	7.08	0.88	2.46	1.02
3350	COMMUNICATIONS EQUIPMENT	1.15	S-	105.19	5.75	13.28	15.55	1.14
3360	ELECTRICAL INDUSTRIAL EQUIP.	0.88	H	35.14	2.49	0.72	2.79	1.01
3380	ELECTRIC WIRE AND CABLE	0.67	IH	NA	NA	0.00	0.00	1.00
3391	BATTERY	0.19	H	23.40	7.62	1.60	3.63	1.03
3399	MISC. ELECTRICAL PRODUCTS NES	0.39	H	36.34	5.90	0.59	0.00	1.01

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TABLE A7: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL A (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
17. NON-METALLIC MINERAL								
3511	CLAY PRODUCTS (DOMESTIC CLAYS)	0.08	H	9.69	7.30	3.85	5.95	1.08
3512	CLAY PRODUCTS (IMPORTED CLAYS)	0.05	S-	22.40	30.98	10.56	11.15	1.11
3520	CEMENT	0.47	S	NA	NA	0.00	0.00	1.00
3530	STONE PRODUCTS	0.02	S	NA	NA	0.00	0.00	1.00
3541	CONCRETE PIPE	0.07	S	NA	NA	0.00	0.00	1.00
3542	STRUCTURAL CONCRETE PRODUCTS	0.09	IU	NA	NA	0.00	0.00	1.00
3549	CONCRETE PRODUCTS NES	0.16	S	NA	NA	0.00	0.00	1.00
3550	READY-MIX CONCRETE	0.47	U	8.08	1.08	1.91	5.39	1.06
3561	GLASS	0.32	H	65.35	12.90	6.04	5.47	1.13
3562	GLASS PRODUCTS	0.16	S-	50.99	19.37	24.00	19.75	1.27
3570	ABRASIVES	0.13	S+	NA	NA	0.00	0.00	1.00
3580	LIME	0.06	U	6.42	6.94	11.11	13.22	1.46
3599	MISC. NON-METALLIC MINERAL PRODS. NES	0.43	S-	42.83	6.30	9.35	9.79	1.10
18. PETROLEUM AND COAL								
3651	PETROLEUM REFINING	7.92	H	696.91	5.52	0.59	1.34	1.01
3652	LUBRICATING OILS AND GREASE	0.10	IH	NA	NA	0.00	0.00	1.00
19. CHEMICALS								
3730	PLASTICS & SYNTHETIC RESINS	0.84	H	55.30	4.14	0.34	0.70	1.01
3740	PHARMACEUTICALS AND MEDICINES	0.79	H	36.62	2.89	1.37	2.16	1.03
3750	PAINT AND VARNISH	0.42	H	37.71	5.66	0.78	0.99	1.02
3760	SOAP AND CLEANING COMPOUNDS	0.55	H	300.00	34.31	0.07	0.00	1.00
3770	TOILET PREPARATIONS	0.30	L	59.91	12.34	20.15	25.41	1.24
3781	PIGMENTS AND DRY COLOURS	0.14	S	NA	NA	0.00	0.00	1.00
3782	INDUSTRIAL CHEM. (INORGANIC) NES	1.07	S	NA	NA	0.00	0.00	1.00
3783	INDUSTRIAL CHEMICALS (ORGANIC) NES	1.57	S	NA	NA	0.00	0.00	1.00
3791	PRINTING INKS	0.11	IU	NA	NA	0.00	0.00	1.00
3799	MISCELLANEOUS CHEMICAL NES	0.79	H	31.64	2.51	0.84	3.41	1.02
20. MISCELLANEOUS								
3911	INSTRUMENT & RELATED PRODUCTS	0.56	L	40.05	4.47	12.35	15.67	1.15
3914	OPHTHALMIC GOODS	0.06	S	NA	NA	0.00	0.00	1.00
3920	JEWELLERY AND SILVERWARE	0.55	U	5.75	0.65	1.29	9.06	1.04
3931	SPORTING GOODS	0.22	S	NA	NA	0.00	0.00	1.00
3932	TOYS AND GAMES	0.18	S	NA	NA	0.00	0.00	1.00
3970	SIGNS AND DISPLAYS	0.13	S-	3.28	1.61	6.70	4.79	1.07
3991	BROOM, BRUSH AND MOP	0.05	S	NA	NA	0.00	0.00	1.00
3993	FLOOR TITLE, LINOLEUM ETC.	0.15	IH	NA	NA	0.00	0.00	1.00
3994	SOUND RECORDING-MUSICAL INSTRUMENTS	0.10	IU	NA	NA	0.00	0.00	1.00
3999	OTHER MISCELLANEOUS	0.15	S	NA	NA	0.00	0.00	1.00

1. NA - UNDEFINED

2. INDUSTRY PRODUCTION CORRESPONDS TO INDUSTRY GROSS OUTPUT WHERE EXCLUSION CRITERIA 1 TO 3 OF TEXT TABLE 2 ARE APPLIED.

3. SEE TEXT TABLE 1 FOR A DESCRIPTION OF SHAPE SYMBOLS.

TABLE A8: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL 8 (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
1. FOOD AND BEVERAGE								
1011	SLAUGHTERING AND MEAT PROCESSORS	4.27	S	NA	NA	0.00	0.00	1.00
1012	POULTRY PROCESSORS	0.64	IH	NA	NA	0.00	0.00	1.00
1020	FISH PRODUCTS	0.94	S-	24.30	1.61	6.38	5.68	1.07
1031	FRUIT & VEG. CANNERS & PRESERVERS	0.78	H	58.52	4.72	0.67	1.96	1.01
1032	FROZEN FRUIT & VEGETABLE PROCESSORS	0.21	S	NA	NA	0.00	0.00	1.00
1040	DAIRY PRODUCTS	2.72	S	NA	NA	0.00	0.00	1.00
1050	FLOUR & BREAKFAST CEREAL PRODS.	0.55	IU	NA	NA	0.00	0.00	1.00
1060	FEED	1.22	S-	27.90	1.43	7.84	5.23	1.08
1071	BISCUITS	0.21	S-	51.60	15.58	15.08	12.45	1.16
1072	BAKERIES	0.66	H	26.74	2.54	0.27	1.43	1.01
1081	CONFECTIONERY	0.39	H	70.26	11.21	0.42	2.80	1.01
1082	CANE AND BEET SUGAR PROCESSORS	0.31	S	NA	NA	0.00	0.00	1.00
1083	VEGETABLE OIL MILLS	0.42	S	NA	NA	0.00	0.00	1.00
1089	MISC. FOOD PROCESSORS NES	1.73	S-	109.45	3.96	5.94	6.56	1.06
1091	SOFT DRINK	0.67	S+	NA	NA	0.00	0.00	1.00
1092	DISTILLERIES	0.42	H	92.41	13.63	0.91	2.69	1.02
1093	BREWERIES	0.70	S-	110.68	9.97	15.43	11.40	1.17
1094	WINERIES	0.09	S	NA	NA	0.00	0.00	1.00
2. TOBACCO								
1530	TOBACCO PRODUCTS MANUFACTURERS	0.53	S-	208.86	24.69	15.06	11.19	1.16
3. RUBBER AND PLASTICS								
1623	TIRE AND TUBE	NA	NA	NA	NA	NA	NA	NA
1629	MISC. RUBBER PRODUCTS	NA	NA	NA	NA	NA	NA	NA
1650	PLASTICS FABRICATING NES	1.21	H	17.56	0.91	0.81	3.20	1.02
4. LEATHER								
1720	LEATHER TANNERIES	0.14	S	NA	NA	0.00	0.00	1.00
1740	SHOE	0.37	H	21.14	3.58	0.78	1.82	1.02
1792	BOOT AND SHOE FINDINGS	0.03	S	NA	NA	0.00	0.00	1.00
1799	MISC. LEATHER PRODUCTS	0.10	H	16.03	10.51	0.28	1.59	1.01
5. TEXTILE								
1810	COTTON YARN AND CLOTH	0.38	S-	204.38	33.57	9.26	8.96	1.10
1820	WOOL YARN AND CLOTH	0.14	U	6.41	2.78	2.70	7.10	1.09
1831	FIBRE AND FILAMENT YARN	0.36	S	NA	NA	0.00	0.00	1.00
1832	THROWSTERS, SPUN YARN & CLOTH	0.45	IH	NA	NA	0.00	0.00	1.00
1852	PRESSED AND PUNCHED FELT	0.02	U	3.39	10.69	12.18	10.62	1.53
1860	CARPET, MAT AND RUG	0.35	S	NA	NA	0.00	0.00	1.00
1871	COTTON AND JUTE BAGS	0.03	U	3.55	7.51	16.87	8.71	1.88
1872	CANVAS PRODUCTS	0.05	S-	4.98	6.59	7.16	5.75	1.07
1880	AUTOMOBILE FABRIC ACCESSORIES	0.26	IH	NA	NA	0.00	0.00	1.00
1892	NARROW FABRIC MILLS	0.04	H	8.37	13.32	3.38	6.25	1.07
1893	EMBROIDERY, PLEATING, HEMSTITCHING	0.02	S	NA	NA	0.00	0.00	1.00
1899	MISCELLANEOUS TEXTILE NES	0.38	IU	NA	NA	0.00	0.00	1.00

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TABLE A8: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL B (1)

INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
6. KNITTING MILLS							
2310 HOSIERY	0.09	S-	11.38	7.85	6.04	4.54	1.06
2391 KNITTED FABRIC	0.18	M	16.98	5.86	1.81	2.73	1.04
2392 OTHER KNITTING	0.23	M	10.90	2.98	1.14	1.85	1.02
7. CLOTHING							
2431 MEN'S CLOTHING	0.75	S-	19.14	1.60	19.12	29.01	1.21
2441 WOMEN'S CLOTHING	0.78	S-	10.18	0.82	3.38	3.00	1.03
2450 CHILDREN'S CLOTHING	0.16	S	NA	NA	0.00	0.00	1.00
2460 FUR GOODS	0.13	U	6.58	3.16	1.07	2.48	1.03
2480 FOUNDATION GARMENT	0.06	S-	15.77	16.16	24.77	20.20	1.28
2492 HAT AND CAP	0.02	S	NA	NA	0.00	0.00	1.00
2499 MISCELLANEOUS CLOTHING NES	0.04	U	2.49	4.10	4.98	11.27	1.17
8. WOOD							
2511 SHINGLE MILLS	0.07	IM	NA	NA	0.00	0.00	1.00
2513 SAWMILLS AND PLANNING MILLS	3.54	U	8.21	0.15	0.52	4.59	1.02
2520 VENEER AND PLYWOOD MILLS	0.59	U	6.25	0.67	1.10	5.93	1.03
2541 SASH, DOOR AND OTHER MILLWORK NES	0.52	M	10.50	1.26	0.52	1.44	1.01
2543 PRE-FABRICATED BLDGS. (WOOD FRAME)	0.20	M	14.31	4.58	2.25	5.27	1.05
2544 WOODEN KITCHEN CABINETS	0.12	L	6.97	3.68	8.20	8.16	1.10
2560 WOODEN BOX	0.10	S	NA	NA	0.00	0.00	1.00
2580 COFFIN AND CASKET	0.02	M	3.34	11.76	2.87	2.99	1.06
2591 WOOD PRESERVATION	0.08	S-	NA	NA	0.00	0.00	1.00
2592 WOOD HANDLES AND TURNING	0.02	S-	7.87	22.69	11.59	11.30	1.12
2593 PARTICLE BOARD	0.11	M	18.29	10.34	1.38	0.71	1.03
2599 MISCELLANEOUS WOOD NES	0.04	S	NA	NA	0.00	0.00	1.00
9. FURNITURE AND FIXTURES							
2619 HOUSEHOLD FURNITURE NES	0.63	M	9.83	0.98	0.61	2.72	1.01
2640 OFFICE FURNITURE	0.19	U	6.03	2.03	2.17	4.42	1.07
2660 MISC. FURNITURE AND FIXTURE	0.33	M	7.46	1.40	1.37	3.66	1.03
2680 ELECTRIC LAMP AND SHADE	0.03	IU	NA	NA	0.00	0.00	1.00
10. PAPER AND ALLIED							
2710 PULP AND PAPER MILLS	5.97	L	169.12	1.77	8.45	6.32	1.09
2720 ASPHALT ROOFING	0.17	IU	NA	NA	0.00	0.00	1.00
2731 FOLDING CARTON AND SET-UP BOX	0.25	U	4.98	1.23	1.95	5.23	1.06
2732 CORRUGATED BOX	0.49	S	NA	NA	0.00	0.00	1.00
2733 PAPER AND PLASTIC BAG	0.32	S	NA	NA	0.00	0.00	1.00
2740 MISCELLANEOUS PAPER CONVERTERS	0.70	IM	NA	NA	0.00	0.00	1.00
11. PRINTING, PUBLISHING AND ALLIED							
2860 COMMERCIAL PRINTING	1.24	M	15.58	0.79	0.44	2.76	1.01
2870 PLATEMAKING, TYPESETTING ETC.	0.14	M	4.58	2.07	0.84	2.17	1.02
2890 PUBLISHING AND PRINTING	0.88	U	7.26	0.52	0.60	7.78	1.02

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TABLE A8: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR -DIGIT INDUSTRIES : MODEL 8 (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
12. PRIMARY METAL								
2910	IRON AND STEEL MILLS	3.77	S	NA	NA	0.00	0.00	1.00
2920	STEEL PIPE AND TUBE MILLS	0.49	S	NA	NA	0.00	0.00	1.00
2940	IRON FOUNDRIES	0.35	S	NA	NA	0.00	0.00	1.00
2950	SMELTING AND REFINING	2.46	H	265.86	6.76	1.24	3.76	1.03
2960	ALUMINUM ROLLING, CASTING ETC.	0.65	U	27.32	2.65	1.93	9.46	1.06
2970	COPPER & COPPER ALLOY ROLLING ETC.	0.38	S	NA	NA	0.00	0.00	1.00
2980	METAL ROLLING, CASTING ETC. NES	0.41	S+	NA	NA	0.00	0.00	1.00
13. METAL FABRICATING								
3010	BOILER AND PLATE WORKS	0.39	U	9.88	1.58	0.85	9.21	1.03
3020	FAB. STRUCTURAL METAL	0.75	U	8.85	0.74	0.96	3.54	1.03
3031	METAL DOOR AND WINDOW	0.32	H	10.71	2.10	1.32	2.71	1.03
3039	ORNAMENT & ARCHITECTURAL METAL NES	0.30	S-	23.08	4.88	5.76	13.31	1.06
3042	METAL STAMPING AND PRESSING	1.48	U	9.37	0.40	0.79	3.60	1.02
3051	FASTENER	0.14	S-	73.87	33.54	9.38	8.78	1.10
3059	WIRE AND WIRE PRODUCTS NES	0.09	H	63.82	46.86	0.18	2.87	1.00
3060	HARDWARE, TOOL AND CULTERY	0.56	L	6.90	0.77	2.94	1.37	1.04
3070	HEATING EQUIPMENT	0.23	S	NA	NA	0.00	0.00	1.00
3080	MACHINE SHOPS	0.27	H	6.62	1.55	1.88	5.36	1.04
3090	MISC. METAL FABRICATING	0.82	H	22.48	1.71	0.60	2.35	1.01
14. MACHINERY								
3110	AGRICULTURAL IMPLEMENT	0.84	S+	NA	NA	0.00	0.00	1.00
3150	MISC. MACHINERY AND EQUIPMENT	3.02	H	33.85	0.70	0.36	3.46	1.01
3160	COMMERCIAL REFRIG. AIR COND.	0.21	S	NA	NA	0.00	0.00	1.00
3180	OFFICE AND STORE MACHINERY	0.53	IH	NA	NA	0.00	0.00	1.00
15. TRANSPORTATION EQUIPMENT								
3210	AIRCRAFT & AIRCRAFT PARTS	1.13	H	500.95	27.82	0.06	2.52	1.00
3230	MOTOR VEHICLE	10.14	S+	NA	NA	0.00	0.00	1.00
3241	TRUCK BODY	0.19	S	NA	NA	0.00	0.00	1.00
3242	NON-COMMERCIAL TRAILER	0.28	H	20.22	4.53	0.85	2.07	1.02
3243	COMMERCIAL TRAILER	0.22	U	8.60	2.41	1.17	5.16	1.04
3250	MOTOR VEHICLE PARTS & ACCESSORIES	2.90	S	NA	NA	0.00	0.00	1.00
3260	RAILROAD ROLLING STOCK	0.71	S+	NA	NA	0.00	0.00	1.00
3270	SHIPBUILDING AND REPAIR	0.54	IH	NA	NA	0.00	0.00	1.00
3280	BOATBUILDING AND REPAIR	0.09	S-	11.20	8.17	6.14	6.65	1.06
16. ELECTRICAL								
3310	SMALL ELECTRICAL APPLIANCES	0.22	S	NA	NA	0.00	0.00	1.00
3320	MAJOR APPLIANCES	0.56	IU	NA	NA	0.00	0.00	1.00
3330	LIGHTING FIXTURES	0.13	H	15.23	7.08	1.11	2.64	1.02
3350	COMMUNICATIONS EQUIPMENT	1.15	S-	105.19	5.75	6.07	6.99	1.06
3360	ELECTRICAL INDUSTRIAL EQUIP.	0.88	H	35.14	2.49	0.60	1.95	1.01
3380	ELECTRIC WIRE AND CABLE	0.67	IH	NA	NA	0.00	0.00	1.00
3391	BATTERY	0.19	H	23.40	7.62	1.57	3.06	1.03
3399	MISC. ELECTRICAL PRODUCTS NES	0.39	L	48.40	7.53	8.24	8.22	1.09

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TABLE A8: STATISTICS DERIVED FROM ESTIMATES OF THE LONG-RUN AVERAGE COST CURVE FOR FOUR-DIGIT INDUSTRIES: MODEL B (1)

	INDUSTRY	SHARE OF MANUFACTURING PRODUCTION (2) (%)	SHAPE (3)	MES (MILLIONS)	MES/INDUSTRY PRODUCTION (2) (%)	AVERAGE COST DISADVANTAGE AT ONE-HALF MES (%)	COST SAVING ACHIEVABLE (%)	SCALE ELASTICITY AT ONE-HALF MES
17. NON-METALLIC MINERAL								
3511	CLAY PRODUCTS (DOMESTIC CLAYS)	0.08	H	9.69	7.30	2.92	4.39	1.06
3512	CLAY PRODUCTS (IMPORTED CLAYS)	0.05	IU	NA	NA	0.00	0.00	1.00
3520	CEMENT	0.47	S	NA	NA	0.00	0.00	1.00
3530	STONE PRODUCTS	0.02	S	NA	NA	0.00	0.00	1.00
3541	CONCRETE PIPE	0.07	S	NA	NA	0.00	0.00	1.00
3542	STRUCTURAL CONCRETE PRODUCTS	0.09	IU	NA	NA	0.00	0.00	1.00
3549	CONCRETE PRODUCTS NES	0.16	S	NA	NA	0.00	0.00	1.00
3550	READY-MIX CONCRETE	0.47	U	6.74	0.90	1.23	2.83	1.04
3561	GLASS	0.32	U	39.90	7.88	18.49	8.01	2.04
3562	GLASS PRODUCTS	0.16	S-	50.99	19.37	13.49	9.48	1.14
3570	ABRASIVES	0.13	S+	NA	NA	0.00	0.00	1.00
3580	LIME	0.06	H	16.56	17.91	3.35	6.44	1.07
3599	MISC. NON-METALLIC MINERAL PRODS. NES	0.43	S	NA	NA	0.00	0.00	1.00
18. PETROLEUM AND COAL								
3651	PETROLEUM REFINING	7.92	H	696.91	5.52	0.33	0.72	1.01
3652	LUBRICATING OILS AND GREASE	0.10	IU	NA	NA	0.00	0.00	1.00
19. CHEMICALS								
3730	PLASTICS & SYNTHETIC RESINS	0.84	H	55.30	4.14	0.32	0.49	1.01
3740	PHARMACEUTICALS AND MEDICINES	0.79	H	36.62	2.89	1.16	2.87	1.02
3750	PAINT AND VARNISH	0.42	H	37.71	5.66	0.95	2.70	1.02
3760	SOAP AND CLEANING COMPOUNDS	0.55	H	300.00	34.31	0.09	0.00	1.00
3770	TOILET PREPARATIONS	0.30	S-	59.91	12.34	13.33	13.15	1.14
3781	PIGMENTS AND DRY COLOURS	0.14	S	NA	NA	0.00	0.00	1.00
3782	INDUSTRIAL CHEM. (INORGANIC) NES	1.07	H	98.31	5.76	0.19	2.63	1.00
3783	INDUSTRIAL CHEMICALS (ORGANIC) NES	1.57	U	30.89	1.23	1.82	12.56	1.06
3791	PRINTING INKS	0.11	S	NA	NA	0.00	0.00	1.00
3799	MISCELLANEOUS CHEMICAL NES	0.79	H	31.64	2.51	0.72	3.73	1.01
20. MISCELLANEOUS								
3911	INSTRUMENT & RELATED PRODUCTS	0.56	H	32.51	3.63	1.37	2.47	1.03
3914	OPHTHALMIC GOODS	0.06	IU	NA	NA	0.00	0.00	1.00
3920	JEWELLERY AND SILVERWARE	0.55	S+	NA	NA	0.00	0.00	1.00
3931	SPORTING GOODS	0.22	H	16.23	4.61	0.34	2.04	1.01
3932	TOYS AND GAMES	0.18	S	NA	NA	0.00	0.00	1.00
3970	SIGNS AND DISPLAYS	0.13	S-	3.28	1.61	8.01	6.57	1.08
3991	BROOM, BRUSH AND MOP	0.05	S	NA	NA	0.00	0.00	1.00
3993	FLOOR TITLE, LINOLEUM ETC.	0.15	IH	NA	NA	0.00	0.00	1.00
3994	SOUND RECORDING-MUSICAL INSTRUMENTS	0.10	S-	55.00	33.72	48.46	27.98	1.65
3999	OTHER MISCELLANEOUS	0.15	S	NA	NA	0.00	0.00	1.00

1. NA - UNDEFINED

2. INDUSTRY PRODUCTION CORRESPONDS TO INDUSTRY GROSS OUTPUT WHERE EXCLUSION CRITERIA 1 TO 3 OF TEXT TABLE 2 ARE APPLIED.

3. SEE TEXT TABLE 1 FOR A DESCRIPTION OF SHAPE SYMBOLS.

TABLE A9 : ESTIMATED COEFFICIENTS OF THE LONG-RUN AVERAGE COST CURVE : MODEL A (1)

	INDUSTRY	N (2)	B_1	B_2	B_3	B_4	B_5	B_9	R^2
1. FOOD AND BEVERAGE									
1011	SLAUGHTERING AND MEAT PROCESSORS	127	-0.133(10)	0.000	0.000	0.093(5)	-0.055(5)	-0.040(5)	0.07
1012	POULTRY PROCESSORS	44	-0.316(10)	0.000	-0.161	0.057	0.041	0.081(5)	0.21
1020	FISH PRODUCTS	96	-0.474(1)	-0.007(1)	0.000	0.177(5)	0.035	0.014	0.13
1031	FRUIT & VEG. CANNERS & PRESERVERS	49	-0.441(1)	0.000	0.438(1)	0.027	0.005	0.092(1)	0.32
1032	FROZEN FRUIT & VEGETABLE PROCESSORS	17	0.110	0.000	0.000	-0.043	-0.214(10)	0.112(5)	0.33
1040	DAIRY PRODUCTS	99	-0.227(5)	0.000	0.128(5)	-0.066(10)	0.087(1)	0.081(1)	0.13
1050	FLOUR & BREAKFAST CEREAL PRODS.	22	0.594	-0.005(1)	-0.877(10)	-0.098	-0.112	-0.210(10)	0.60
1060	FEED	64	-0.178(10)	-0.006(1)	0.000	0.092(10)	-0.021	0.021	0.28
1071	BISCUITS	21	0.038	-0.005(5)	0.000	-0.076	-0.023	-0.011	0.41
1072	BAKERIES	43	-0.354(1)	0.000	0.085(1)	-0.002	0.028	-0.028	0.17
1081	CONFECTIONERY	27	-0.499(10)	0.000	0.374(1)	-0.167	0.144	0.248(1)	0.56
1082	CANE AND BEET SUGAR PROCESSORS	8	1.428(10)	-0.002(5)	0.000	-0.364	-0.274(5)	-0.734(5)	0.90
1083	VEGETABLE OIL MILLS	7	-0.328(10)	0.008(5)	40.559(5)	-1.148(5)	0.637(5)	0.027	0.99
1089	MISC. FOOD PROCESSORS NES	97	-0.771(1)	-0.001(10)	0.181(5)	0.218(5)	0.020	-0.017	0.10
1091	SOFT DRINK	26	-0.395	0.000	-0.298(10)	0.169	-0.055	0.063	0.41
1092	DISTILLERIES	21	-1.131	0.000	1.056(10)	0.099	0.108	-0.023	0.17
1093	BREWERIES	31	-1.832(5)	-0.003(5)	0.568	0.573(10)	-0.054	8.842(10)	0.43
1094	WINERIES	17	-0.421(10)	0.000	0.000	0.158	-0.138	-0.148	0.10
2. TOBACCO									
1530	TOBACCO PRODUCTS MANUFACTURERS	9	0.118	0.000	0.000	-0.518	0.198	0.284(10)	0.41
3. RUBBER AND PLASTICS									
1623	TIRE AND TUBE	NA	NA	NA	NA	NA	NA	NA	NA
1629	MISC. RUBBER PRODUCTS	NA	NA	NA	NA	NA	NA	NA	NA
1650	PLASTICS FABRICATING NES	225	-0.240(5)	0.000	0.136(1)	-0.040	-0.006	0.033(10)	0.09
4. LEATHER									
1720	LEATHER TANNERIES	15	0.135	0.000	0.000	-0.118	-0.020	-0.010	0.03
1740	SHOE	65	-0.479(1)	0.000	0.165(1)	0.025	0.074(5)	-0.042(10)	0.26
1792	BOOT AND SHOE FINDINGS	13	-0.636(10)	0.000	0.000	-0.140	0.264(10)	-0.060	0.32
1799	MISC. LEATHER PRODUCTS	32	-0.188	0.000	0.046(10)	-0.092	0.028	0.031	0.12
5. TEXTILE									
1810	COTTON YARN AND CLOTH	16	0.272	-0.001(10)	0.000	-0.477(10)	0.192	0.065	0.32
1820	WOOL YARN AND CLOTH	22	0.274	0.000	0.000	-0.277(10)	-0.069	0.240(5)	0.33
1831	FIBRE AND FILAMENT YARN	7	2.239(5)	-0.003(5)	0.000	-1.406(1)	0.049	0.607	0.99
1832	THROWSTERS, SPUN YARN & CLOTH	50	-0.276	0.000	0.223(10)	0.001	0.060	-0.083(10)	0.11
1852	PRESSED AND PUNCHED FELT	7	-0.491	0.069	0.832	-0.384	0.154	0.036	0.94
1860	CARPET, MAT AND RUG	23	0.033	-0.002	0.000	-0.252(10)	0.133	-0.191	0.17
1871	COTTON AND JUTE BAGS	11	-0.253	0.000	0.000	0.187	-0.096	-0.337	0.42
1872	CANVAS PRODUCTS	15	-0.125	-0.033	0.000	-0.089	0.023	0.068	0.16
1880	AUTOMOBILE FABRIC ACCESSORIES	9	0.239	0.000	0.000	-0.370(10)	0.158	-0.349(5)	0.50
1892	NARROW FABRIC MILLS	15	-0.945(10)	0.000	0.292(1)	0.229	0.063	0.108	0.50
1893	EMBROIDERY, PLEATING, HEMSTITCHING	14	1.908(10)	-0.159(10)	-0.527(5)	-0.191	-0.536(10)	-0.029	0.90
1899	MISCELLANEOUS TEXTILE NES	61	-0.555(5)	-0.008(1)	-0.073	0.129	0.044	0.118(5)	0.15

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TABLE A9 : ESTIMATED COEFFICIENTS OF THE LONG-RUN AVERAGE COST CURVE : MODEL A (1)

	INDUSTRY	N (2)	B_1	B_2	B_3	B_4	B_5	B_9	R^2
6. KNITTING MILLS									
2310	HOSIERY	28	-0.241	-0.011(5)	0.000	0.046	0.000	-0.002	0.14
2391	KNITTED FABRIC	33	-0.031	0.000	0.257(5)	-0.084	-0.015	-0.031	0.23
2392	OTHER KNITTING	76	-0.518	0.000	0.126(1)	0.120	0.010	-0.005	0.14
7. CLOTHING									
2431	MEN'S CLOTHING	148	-0.471(1)	0.000	0.055(5)	0.032	0.077(1)	0.017	0.07
2441	WOMEN'S CLOTHING	231	-0.294(1)	-0.006(1)	0.000	0.060(10)	-0.010	-0.001	0.04
2450	CHILDREN'S CLOTHING	70	-0.109	0.000	0.000	-0.043	-0.015	-0.003	0.01
2460	FUR GOODS	20	0.397(1)	0.003(10)	0.000	-0.190(1)	-0.076(5)	0.147(1)	0.61
2480	FOUNDATION GARMENT	12	-1.559(10)	-0.048(1)	0.000	0.512	0.368(5)	-0.181	0.72
2492	HAT AND CAP	10	0.086	0.000	0.000	-0.175	-0.035	0.015	0.26
2499	MISCELLANEOUS CLOTHING NES	10	0.261	0.000	0.000	-0.268	-0.105	0.112	0.05
8. WOOD									
2511	SHINGLE MILLS	20	-0.510(1)	0.000	0.000	0.220(1)	-0.076(10)	0.089	0.41
2513	SAWMILLS AND PLANNING MILLS	367	-0.460	0.001(5)	0.111(1)	0.061(10)	0.000	0.028	0.05
2520	VENEER AND PLYWOOD MILLS	55	-0.648(1)	0.000	0.240(5)	0.153(5)	0.026	0.117(10)	0.13
2541	SASH, DOOR AND OTHER MILLWORK NES	134	-0.544(1)	0.000	0.085(1)	0.037	0.090(1)	0.027	0.10
2543	PRE-FABRICATED BLDGS. (WOOD FRAME)	41	-0.873	0.000	0.377(1)	0.148(10)	0.115(10)	-0.048	0.37
2544	WOODEN KITCHEN CABINETS	56	-0.143	-0.017(10)	0.111(10)	-0.051	-0.034	0.127(10)	0.30
2560	WOODEN BOX	28	-0.339(5)	0.000	0.000	0.047	0.014	0.016	0.02
2580	COFFIN AND CASKET	13	-0.235	0.000	0.066	0.139	-0.124(10)	-0.227	0.64
2591	WOOD PRESERVATION	17	-0.815	0.000	0.000	-0.278	0.532(10)	0.105	0.22
2592	WOOD HANDLES AND TURNING	11	-0.086	0.000	0.000	0.221	-0.256(10)	-0.230	0.36
2593	PARTICLE BOARD	14	-0.145	0.000	0.208(1)	-0.226(5)	0.127(10)	-0.233	0.73
2599	MISCELLANEOUS WOOD NES	17	-0.388	0.000	0.000	-0.006	0.062	0.046	0.01
9. FURNITURE AND FIXTURES									
2619	HOUSEHOLD FURNITURE NES	239	-0.417(1)	0.000	0.069(1)	0.062	0.011	0.004	0.03
2640	OFFICE FURNITURE	43	-0.482(10)	0.007	0.280(5)	-0.093	0.094	-0.010	0.12
2660	MISC. FURNITURE AND FIXTURE	103	-0.471(1)	0.000	0.116(1)	0.055	0.025	0.030	0.12
2680	ELECTRIC LAMP AND SHADE	19	-0.333(10)	0.000	0.000	0.400(5)	-0.303(5)	0.171(5)	0.26
10. PAPER AND ALLIED									
2710	PULP AND PAPER MILLS	130	-0.325	-0.001(1)	0.350(5)	-0.125	0.123	0.138(1)	0.20
2720	ASPHALT ROOFING	10	1.434(5)	0.011	3.526(5)	0.225	-1.235(5)	0.477(10)	0.93
2731	FOLDING CARTON AND SET-UP BOX	47	-0.304(10)	0.008(5)	0.200(5)	0.041	-0.040	-0.029	0.13
2732	CORRUGATED BOX	62	-0.272(5)	0.000	0.152	0.147(5)	-0.093(5)	0.012	0.09
2733	PAPER AND PLASTIC BAG	61	-0.368(1)	0.000	0.000	-0.064	0.126(5)	0.052	0.09
2740	MISCELLANEOUS PAPER CONVERTERS	87	-0.601(1)	0.000	0.000	0.105(10)	0.047	0.030	0.06
11. PRINTING, PUBLISHING AND ALLIED									
2860	COMMERCIAL PRINTING	392	-0.677(1)	0.000	0.100(1)	0.091(1)	0.052(5)	0.035(1)	0.11
2870	PLATEMAKING, TYPESETTING ETC.	83	-0.293(1)	0.000	0.000	-0.016	0.009	0.030	0.00
2890	PUBLISHING AND PRINTING	143	-1.635(1)	0.000	0.164(1)	0.021	0.474(1)	0.191(1)	0.40

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TABLE A9 : ESTIMATED COEFFICIENTS OF THE LONG-RUN AVERAGE COST CURVE : MODEL A (1)

	INDUSTRY	N (2)	B_1	B_2	B_3	B_4	B_5	B_9	R^2
12. PRIMARY METAL									
2910	IRON AND STEEL MILLS	47	0.258	0.000	0.000	-0.041	-0.199(10)	0.110(10)	0.10
2920	STEEL PIPE AND TUBE MILLS	18	-0.180	0.001	0.000	-0.144	0.101	-0.063	0.15
2940	IRON FOUNDRIES	42	-0.415(5)	0.000	0.000	-0.004	0.062	0.008	0.02
2950	SMELTING AND REFINING	19	-0.536	0.000	0.000	1.052(5)	-0.968(5)	0.075	0.57
2960	ALUMINUM ROLLING, CASTING ETC.	23	-0.467(10)	0.001(1)	1.051(1)	0.043	0.019	-0.022	0.72
2970	COPPER & COPPER ALLOY ROLLING ETC.	13	0.321	0.000	-0.407	-0.323	0.124	0.105	0.26
2980	METAL ROLLING, CASTING ETC. NES	35	-0.223	0.005(5)	0.000	-0.062	-0.005	0.053	0.17
13. METAL FABRICATING									
3010	BOILER AND PLATE WORKS	42	-0.323	0.000	0.136(10)	0.245(5)	-0.228(5)	0.059	0.25
3020	FAB. STRUCTURAL METAL	67	-0.438(5)	0.000	0.128(10)	-0.004	0.064	0.109(1)	0.16
3031	METAL DOOR AND WINDOW	80	-0.060	0.000	0.096(10)	-0.081	-0.034	-0.059	0.09
3039	ORNAMENT & ARCHITECTURAL METAL NES	66	-0.273(10)	-0.006(1)	0.000	0.013	0.009	0.013	0.10
3042	METAL STAMPING AND PRESSING	138	-0.450(1)	0.001(10)	0.159(1)	0.023	0.028	0.033	0.06
3051	FASTENER	15	-1.235(5)	-0.004(10)	0.000	0.481(5)	0.022	-0.041	0.35
3059	WIRE AND WIRE PRODUCTS NES	59	-0.398(5)	0.000	0.163(5)	0.106	-0.048	0.017	0.08
3060	HARDWARE, TOOL AND CULTERY	137	-0.403(1)	-0.005(10)	0.086(5)	0.078	-0.058(10)	0.073(5)	0.15
3070	HEATING EQUIPMENT	27	0.065	0.000	0.000	-0.226	0.002	0.075	0.08
3080	MACHINE SHOPS	111	-0.229	0.000	0.142(1)	-0.142(10)	0.036	0.053	0.16
3090	MISC. METAL FABRICATING	132	-0.525(1)	0.000	0.154(1)	0.045	0.053	-0.022	0.10
14. MACHINERY									
3110	AGRICULTURAL IMPLEMENT	44	-0.752(1)	0.000	0.000	0.246(1)	-0.026	0.058(10)	0.20
3150	MISC. MACHINERY AND EQUIPMENT	303	-0.610(1)	0.000	0.122(1)	0.120(1)	-0.001	0.008	0.04
3160	COMMERCIAL REFRIG. AIR COND.	15	-0.804	0.000	0.000	-0.046	0.308	-0.023	0.11
3180	OFFICE AND STORE MACHINERY	13	-0.905(5)	0.000	0.000	0.199	0.053	0.231	0.26
15. TRANSPORTATION EQUIPMENT									
3210	AIRCRAFT & AIRCRAFT PARTS	29	-0.356	0.000	0.000	0.051	-0.012	-0.096	0.07
3230	MOTOR VEHICLE	15	-1.380(5)	0.000	1.090(5)	0.076	0.408(5)	0.056	0.42
3241	TRUCK BODY	30	-0.196	0.000	0.000	-0.019	0.000	0.062	0.03
3242	NON-COMMERCIAL TRAILER	43	-0.319(10)	0.000	0.214(5)	-0.063	0.105(5)	0.029	0.14
3243	COMMERCIAL TRAILER	16	-0.916(5)	0.000	0.312(5)	0.183	0.142	-0.198(1)	0.59
3250	MOTOR VEHICLE PARTS & ACCESSORIES	147	-0.355	0.000	0.000	0.016	0.023	-0.017	0.01
3260	RAILROAD ROLLING STOCK	9	3.894(1)	-0.003(10)	-9.880(5)	-1.753(5)	0.004	0.373(10)	0.92
3270	SHIPBUILDING AND REPAIR	37	-0.361	0.000	-0.291	-0.034	0.102	0.032	0.12
3280	BOATBUILDING AND REPAIR	29	-0.038	-0.013(10)	0.000	0.010	-0.075	-0.059	0.11
16. ELECTRICAL									
3310	SMALL ELECTRICAL APPLIANCES	14	-0.847(10)	0.000	0.132	0.163	0.091	0.016	0.15
3320	MAJOR APPLIANCES	22	-0.729(10)	-0.002	0.000	0.395	-0.136	0.091	0.12
3330	LIGHTING FIXTURES	26	0.126	0.000	0.133(5)	-0.267(5)	0.013	-0.042	0.34
3350	COMMUNICATIONS EQUIPMENT	60	-0.733(5)	-0.002(5)	0.000	0.206	0.004	0.117(10)	0.09
3360	ELECTRICAL INDUSTRIAL EQUIP.	67	-0.860(1)	0.000	0.251(5)	-0.016	0.248(5)	-0.054(10)	0.16
3380	ELECTRIC WIRE AND CABLE	38	-0.102	0.000	-0.187	0.029	-0.060	0.005	0.07
3391	BATTERY	16	-0.191	0.000	0.372(5)	-0.047	-0.019	-0.172(10)	0.57
3399	MISC. ELECTRICAL PRODUCTS NES	23	0.305	0.000	0.212(5)	-0.195	-0.098	-0.057	0.37

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TABLE A9 : ESTIMATED COEFFICIENTS OF THE LONG-RUN AVERAGE COST CURVE : MODEL A (1)

	INDUSTRY	N (2)	B_1	B_2	B_3	B_4	B_5	B_9	R^2
17. NON-METALLIC MINERAL									
3511	CLAY PRODUCTS (DOMESTIC CLAYS)	21	-0.848(10)	0.000	0.366(5)	-0.047	0.172	0.196	0.28
3512	CLAY PRODUCTS (IMPORTED CLAYS)	13	-0.143	-0.009(10)	0.000	0.044	-0.062	-0.159	0.34
3520	CEMENT	18	-1.106(5)	0.000	0.000	-0.475(5)	0.699(1)	-0.447	0.49
3530	STONE PRODUCTS	9	-2.642(10)	0.000	0.000	0.276	0.799(5)	0.357(5)	0.66
3541	CONCRETE PIPE	20	-0.193	0.000	0.000	0.058	-0.077	-0.015	0.01
3542	STRUCTURAL CONCRETE PRODUCTS	16	-0.265	-0.019(5)	-0.223	-0.137	0.158	0.254(5)	0.65
3549	CONCRETE PRODUCTS NES	33	-0.735(1)	0.000	0.000	0.234(10)	-0.084	0.020	0.08
3550	READY-MIX CONCRETE	88	-0.892(1)	0.005(10)	0.306(1)	0.230(1)	0.034	-0.138(1)	0.27
3561	GLASS	8	-2.816(10)	0.000	3.834	0.297	0.682	0.269	0.78
3562	GLASS PRODUCTS	18	-1.037(1)	-0.008(1)	0.000	0.351(1)	0.065(10)	0.059(10)	0.85
3570	ABRASIVES	11	-0.674	0.011	0.000	0.294	-0.105	-0.190	0.22
3580	LIME	11	0.596	0.033(5)	1.353(1)	-0.597(5)	0.002	-0.914(1)	0.87
3599	MISC. NON-METALLIC MINERAL PRODS. NES	35	-1.215(1)	-0.004	0.000	0.310(5)	0.084	0.024	0.14
18. PETROLEUM AND COAL									
3651	PETROLEUM REFINING	35	-0.288	0.000	4.106(1)	-0.044	0.076	0.069(5)	0.20
3652	LUBRICATING OILS AND GREASE	7	1.570(5)	0.000	-1.841(5)	-0.196	-0.517(5)	0.063	0.96
19. CHEMICALS									
3730	PLASTICS & SYNTHETIC RESINS	28	-0.061	0.000	0.190	0.146	-0.218(5)	0.048	0.30
3740	PHARMACEUTICALS AND MEDICINES	38	-1.050(10)	0.000	0.497(5)	-0.002	0.156	0.100	0.13
3750	PAINT AND VARNISH	34	-0.673(5)	0.000	0.294(10)	-0.119	0.246(5)	0.114	0.23
3760	SOAP AND CLEANING COMPOUNDS	19	0.392	0.000	0.224(5)	-0.008	-0.376	0.094	0.49
3770	TOILET PREPARATIONS	21	-2.374	-0.006	0.536	0.237	0.587	0.187	0.30
3781	PIGMENTS AND DRY COLOURS	10	3.528	0.000	0.000	-1.468(10)	-0.288	-1.122	0.31
3782	INDUSTRIAL CHEM. (INORGANIC) NES	38	0.256	0.000	0.000	-0.296(10)	0.014	0.052	0.06
3783	INDUSTRIAL CHEMICALS (ORGANIC) NES	17	-0.124	0.000	0.000	0.074	-0.182	0.079	0.06
3791	PRINTING INKS	11	-2.337(5)	-0.032	-0.588(10)	1.520(5)	-0.283	0.438	0.73
3799	MISCELLANEOUS CHEMICAL NES	55	-0.676(5)	0.000	0.265(5)	0.074	0.024	0.086(10)	0.09
20. MISCELLANEOUS									
3911	INSTRUMENT & RELATED PRODUCTS	20	-1.190(5)	-0.005	0.491(10)	0.309(10)	0.051	0.213(5)	0.23
3914	OPHTHALMIC GOODS	12	-1.012(5)	0.000	0.000	0.455(10)	-0.023	0.110	0.31
3920	JEWELLERY AND SILVERWARE	41	-0.730(1)	0.004(5)	0.148(10)	0.103	0.098(10)	-0.074	0.16
3931	SPORTING GOODS	37	0.059	0.000	0.000	-0.026	-0.155	0.124	0.17
3932	TOYS AND GAMES	13	-0.498	0.000	0.000	0.049	0.011	0.122	0.18
3970	SIGNS AND DISPLAYS	40	-0.084	-0.040(5)	0.000	-0.202(5)	0.083	0.131(5)	0.24
3991	BROOM, BRUSH AND MOP	9	-0.464	0.000	0.000	0.110	-0.027	0.047	0.04
3993	FLOOR TILE, LINOLEUM ETC.	9	-0.538	0.000	-0.508(10)	-0.339	-0.018	-0.006	0.43
3994	SOUND RECORDING-MUSICAL INSTRUMENTS	8	0.910	-0.014(5)	-0.280(10)	-0.358	-0.123	-0.300	0.98
3999	OTHER MISCELLANEOUS	58	-0.581(1)	0.000	0.000	0.103(10)	0.033	-0.072(10)	0.09

1. (L) INDICATES SIGNIFICANTLY DIFFERENT FROM ZERO AT THE L % CONFIDENCE LEVEL FOR A ONE-TAIL T-TEST.

2. NUMBER OF PLANTS AFTER EXCLUSIONS.

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